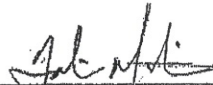
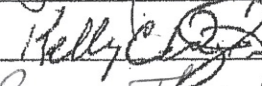


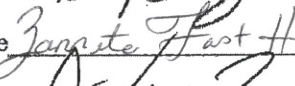
Quality Assurance Project Plan
Culturally Significant Vegetation & Soil Sampling
For
Fort Hall Indian Reservation

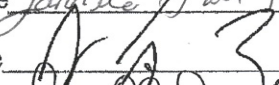
Prepared by
Talía T. Martin (tmartin@sbtribes.com)
Zannita Fast Horse (zpongah@sbtribes.com)

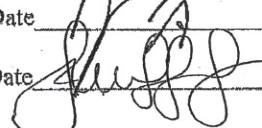
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Project Manager Talia T. Martin Signature/Date  8/20/14

Project QA Officer Kelly Wright Signature/Date  8/20/14

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USEPA-10 Tribal Coordinator James F. Zokan Signature/Date  8/20/14

USEPA QA Officer ^{RDAM} Gina Fierpo Grove Signature/Date  08/20/2014

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1.0 PROJECT MANAGEMENT

1.1 Title and Approval Page - See page 1.

1.2 Table of Contents - See pages 2 - 3.

1.3 Distribution List

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1.4 Project Organization

Project Manager – Talia Martin

The project manager is responsible for ensuring the objectives of the QAPP are executed accurately and efficiently. This includes overseeing the coordination between certified samplers and administration. Additionally, the project manager will provide oversight and direction for contractors and workers involved in this project.

Project QA Manager – Kelly C. Wright

The Project QA Officer is responsible for reviewing and approving the QA Project Plan. He will provide technical input on proposed sampling design, analytical methodologies, and ensure that data quality objectives are met. He will also facilitate coordination between laboratory services.

Project Field Sampling Lead – Zannita Fast Horse

The Field lead will be responsible for supervising and training all field samplers. This includes assigning tasks and making sure task objectives are satisfied.

Contract Laboratory Lead or Contact – Ryan Pattie, IAS Environmental Laboratory

The contracted laboratory lead is within the qualified position of overseeing analyses staff and technicians hired by the contracted laboratory. The laboratory lead is assigning duties to laboratory staff that is qualified to handle sample and perform analytical services as specified in the work plan.

1.5 Problem Definition/Background

The Fort Hall Indian Reservation (Reservation) is the home of the Shoshone and Bannock tribes located in Southeastern Idaho. Major cities bordering Fort Hall: Pocatello, American Falls, and Blackfoot. The Reservation resides within 4 counties, Bannock, Power, Bingham, and Caribou. The Reservation is 546,000 acres and is divided into five districts: Lincoln Creek, Gibson, Fort Hall, Ross Fork and Bannock Creek.

The land within the external borders of The Reservation continues to be a source of subsistence for both traditional and modern day utility. Upon the establishment of the Reservation by the Fort Bridger Treaty in 1868, treaty rights are practiced extensively through self-government, hunting, fishing, gathering, traditional and ceremonial activities.

The Reservation and bordering cities exists on the Eastern Plain Snake River Aquifer. This large groundwater reservoir and various sizes of water bodies surround and flow through the Reservation. One of the largest reservoirs on the Snake River lies on the western edge of the

reservation's boundary. Located within the same region as the reservoir and on the reservation side, is the Fort Hall Bottoms Area (Bottoms). The Bottoms is a prominent area known to locals for hunting birds and wild game as well as fishing of trout along the various streams, creeks, and wetlands. Additionally, Shoshone-Bannock Tribal Members practice traditional activities including, gathering of culturally significant plants for medicinal and ceremonial purposes. Fort Hall Bottoms lies within Gibson and Fort Hall Districts. South of the Bottoms is the Bannock Creek District where agricultural, hunting and gathering activities take place.

The Environmental Waste Management Program (EWMP) continues to build capacity ensuring the protection of resources within the exterior boundaries of the reservation and areas outside the boundaries used by Tribal members for hunting, fishing, gathering and ceremonial activities. This QAPP focuses on culturally significant areas within Fort Hall, Bannock, and Gibson Districts. EWMP continues to provide baseline monitoring of environmental media by increasing the quantitative and qualitative data on culturally related environmental concerns. To continue to build capacity and address environmental and health concerns, there is a need to determine which contaminants are selectively extracted from the external environment and transported through soil and culturally significant (CS) vegetation.

Data collection efforts from previous baseline monitoring sampling activities have provided areas where metal and fluoride concentrations are a concern. Environmental impacts from industrial, hard rock and phosphate ore mining, is a source for contamination onto the Reservation. The community is concerned with the transport of various contaminants via air, soil, and groundwater transport mechanisms. Based on limiting factors such as seasonal, funding, size of reservation we have decided to focus on specific sites within these 3 districts.

Sampling locations are primarily determined by pre-determined factors from previous data collection efforts and traditional knowledge. Previous sampling has provided evidence of elevated metals and fluorides in soil and vegetation during 2013 sampling of soil and vegetation. Cultural knowledge of areas of high interest for hunting, gathering, and traditional activities will be taken in consideration as well.

1.6 Project/Task Description and Schedule

EWMP will collect, generate, and evaluate data to confirm the uptake of COPCs in soil and vegetation on the reservation. This QAPP will refer to documents referenced in the Shoshone-Bannock Tribes QAPP (SBT-QAPP) when appropriate. This information will be used as a standard for sampling and assessing baseline concentrations. The primary objectives of this sampling project are two-fold: 1) *Assess which metals and fluorides in CS vegetation and soils are selectively extracted from surrounding environment through the uptake from soil* 2)

quantify the metals and fluoride concentrations within CS vegetation and soils of the Reservation.

The overall goal of the baseline monitoring is to observe trends of contaminant types and concentrations in environmental media. This study intentionally focuses on the timeframe for assessing the levels for CS plants and surrounding soil during harvesting and ceremonial activities. This time frame is the most active time for gathering and utilizing CS plants.

Secondary, these objectives includes, but not limited to:

1. Obtaining data accurately representing the concentrations of the COPCs in the specified sampling area.
2. Responding to the memberships concerns about culturally significant areas that contain soils and/or CS vegetation with levels of contaminants that could impact human health and the environment.
3. Utilizing the findings of the sampling project to promote health awareness and recommendations to management.

Sampling will occur in August and September to determine the uptake of total metals and fluoride in soil and vegetation. August sampling activities require sampling soil and vegetation in native conditions within a pre-determined sampled plot. September sampling involves sampling the same plot for soil and vegetation. A total of 14 locations will be sampled for CS vegetation and surrounding soil. These locations are within the reservation boundaries and are accessible by vehicles with 4-wheel drive capability.

Technical staff are responsible for conducting all sampling activities ranging from site evaluations, planning and execution sample collection, generating and reviewing data, and writing and reviewing technical reports. The Program Manager is responsible for reviewing and editing the sampling plans, written reports, and other documents generated by technical staff. Technical documents may also be reviewed by other staff from EWMP for cultural and/or technical assistance. This is to ensure that any plans, reports, and activities meet QA/QC requirements.

The collection and analyses of soil and vegetation samples will encompasses the following aspects:

- General sample site locations;
- Number and type of samples proposed for collection;
- Chemicals of concern to be analyzed;

- Sample collection procedures, including equipment decontamination;
- Sample containers and preservatives;
- Sample handling;
- Quality Assurance (QA) and Quality Control (QC); and
- Health and Safety.

During sampling, every attempt will be made to collect samples from each identified location. However, sampling at other locations, not specified herein, may be necessary if unforeseen field conditions require deviations from specified locations. Any deviations from the established sampling locations will be documented by field sampling personnel and presented in the monitoring data report. If changes are significant, prior approval will be requested by the Program Manager who will be responsible for ensuring the sample integrity.

1.7 Quality Objectives and Criteria for Measurement Data

Quality analytical data derived from sample collection is required to sufficiently validate the quantity of metals and fluoride in the samples. Data quality indicators provide measurement criteria to statistically interpret the degree of acceptability or utility of the data by the user. Table 1 provides the definition of the DQO along with the specific criteria to evaluate the data.

Table 1. Key indicators for field and laboratory QA/QC.

Key Indicator	Assessment	Measurement Performance Criteria		QC Sample and/or activity to assess Measurement Performance	
		Lab	Field	Lab	Field
Precision	Measures the degree of agreement between repeated measurements. Precision will be determined by the relative percent difference (RPD) when evaluating results from laboratory controls, laboratory duplicate, and field duplicate samples.	RPD \leq 20% for lab duplicates when detects \geq QL	RPD \leq 30% for field duplicates when detects \geq QL	Field Duplicates	Matrix Spike and Matrix Duplicates
Accuracy Lab	Measures the degree of agreement	Recovery Limit \pm 25%		Matrix Spike	

	between an observed value and a reference or true value. Evaluation of the laboratory matrix spikes will be rejected or accepted based on percent recovery (%R)	Recovery Limit \pm 20%	Matrix Spike Duplicate
Completeness	The amount of data determined valid and if enough data have been collected to meet the DQO. Completeness is determined by comparing the number of valid laboratory sample results to the number of samples collected. The criteria used to judge this is Percent completeness (%C)	90-95% of valid samples	Number of valid samples
Qualitative DQIs			
Representativeness	Evaluates whether the data accurately represents the site conditions. Use of field blanks, field duplicates, and laboratory blanks to monitor potential transport contamination and variation in sampling techniques		
Comparability	Use of field sampling methods and laboratory analytical methods that are comparable and consistent throughout the baseline environmental studies		

Note:

Standard Reference Material for analytes on Table 6

The following equations are used to calculate the data quality indicators for this sampling project:

Equation 1. Relative Percent Difference (RPD)

$$RPD = \left[\frac{|(A - B)|}{\left(\frac{A + B}{2} \right)} \right] \times 100$$

Where:

A = Concentration of the sample

B = Concentration of the duplicate

Equation 2. Percent Recovery (%R)

$$\%R = \left[\frac{(r - S)}{A} \right] \times 100$$

Where:

r = amount of the target analyte recovered in the spiked sample

S = amount of target analyte in the sample

A = amount of target analyte added as spike

Equation 3. Completeness (%C)

$$\%C = \left[\frac{v}{T} \right] \times 100$$

Where:

v = Number of measurements judged valid

T = Total number of measurements

In addition to providing quantitative data the data should meet the following *minimum* qualitative objectives and criteria:

- All samples, including duplicate samples and blank samples, should be collected, packaged, documented, and shipped in accordance with the guidance and protocols provided in the SBT-QAPP. Details pertaining to the collection of each sample, including sample number, sample location, sample matrix characteristics, time of collection, and sample collector's name, should be documented in a written logbook and/or field sheet and supplemented with photographs.

Samples collected by the EWMP will be analyzed by Intermountain Analytical Services (IAS) labs in accordance with *IAS Statements of Work* (SOWs). Analyses will be required to include

Contract Required Detection Limits (CRDLs), Contract Required Quantitation Limits (CRQLs), or other detection limits that, in most cases, will be low enough to ensure that the Sample Quantitation Limits (SQLs) are within acceptable range according to the Program's standards (Table 4) or cancer risk factors of the COPCs (10^{-6} cancer risk factor).

1.7.1 Quality Objectives and Project Decisions

The primary objective is to perform sampling resulting in quantitative assessment of the total metals and fluoride in soils and vegetation within the Reservation. Definitive and screening data is necessary to achieve these objectives and therefore the Program will comply with and employ the EPA's Data Quality Objectives (**EPA, 2000**) process when planning, conducting, and evaluating analytical results from the laboratories and decisions in the field. The following table provides a broad overview and summary of the DQO's considered specifically for the soil and vegetation sampling:

Table 2. Data Quality Objectives Summary

QUESTION	DESCRIPTION	REFERENCE
Step 1. State the Problem	PROBLEM. It is the responsibility of EWMP staff and Tribes' environmental programs to provide the public with information regarding contaminants that may pose a danger to the environment and human health on the Reservation. Culturally significant plants and the surrounding soils are a public concern because of the impact on culture and human health.	Section 1.5
	CONCEPTUAL MODEL. Various sources of metal contaminants and fluoride emissions on and surrounding the reservation. External sources of potential concern have routes of transport via groundwater, air, and soil.	Section 1.4
	DATA REQUIRED & INTENDED USE. The EWMP will determine the baseline concentrations of the elemental composition in soil and the amount extracted by culturally significant plants. The data will be utilized for initial monitoring of metals and fluorides during spring and fall seasons. Characterization of environmental media trends will be monitored for community awareness.	Section 1.5 & 2.1
	LIMITATIONS. Consideration of seasonal factors limiting the sampling time. Timing for harvesting and gathering of CS plants vary. Culturally Sensitive areas may be off limits due to traditional ceremonies.	Section 1.5 - 1.6

Step 2. Identify the Goals	PRINCIPAL QUESTION: What are the seasonal levels of metals and fluorides in the CS and surrounding soils?	Section 1.6
	OUTCOMES: 1. Continue monitoring level of metals and fluorides CS plants & soil seasonally to observe trends.	
	2. Characterize elemental composition of predominant areas where gathering of CS plants occurs.	
Step 3. Identify Information Inputs	Quantitative determination of metal and fluoride concentration in soil and collocated plants. Field qualitative assessment of environmental conditions and screening of soil. Culturally Significant plants are identified by EWMP database of CS vegetation.	Section 2.0, 2.1 & References
	Field Data & Measurements: Environmental conditions (temperature, time, wind), Soil pH and conductivity	
	Laboratory Samples: Vegetation tissue samples and Collocated soil	
	Pre-existing Data: Tribes Air Quality particulate exposure survey, EWMP 2006 Fluoride Report, EWMP GAP Grant 2013 Soil and Vegetation Sampling data	References
Step 4. Define Boundaries	The overall Sampling area is located within the Fort Hall Indian Reservation Boundaries. To limit the size area for sampling, we focus on The Bottoms Area and the Bannock Creek Area for 2014 sampling.	Section 1.5 & 2.1.1
	Individual sampling site areas are comprised of 3 x 3 area of soil, encompassing the plant of interest.	Section 2.1.3
	The time frame of the sampling event was determined by cultural activities that depend on the gathering of CS plants. Generally, early June to August is a time for gathering for ceremonies, whereas early September gathering is for harvest.	Section 2.1.1
	Sample collection will follow the sampling protocol for consistency and comparability. Sampling protocol includes, correct site, sampling area, and technique. Following the protocol allows for comparable results and certainty.	Section 2.2.2-2.2.7 and Table 4
Step 5. Develop the Analytic Approach	Sampling results are compared to screening levels for soil and vegetation. The samples are representative of plants within that decision unit that may or may not cause risk if consumed. This information will be provided to the community for informative purposes only.	Section 2.4 & Table 6
Step 6. Specify Performance or Acceptance Criteria	Data quality indicators (DQIs) are utilized to define acceptable data quality of field sampling and data analysis.	Section 1.7 & 4.0
	DQIs are used to evaluate QA/QC Samples, performance levels and acceptance criteria	

Step 7. Develop the Plan for Obtaining Data	The best approach to satisfy our data quality objectives is to employ a judgmental sampling design. This sampling is a baseline assessment of the most prominent areas for gathering CS plants.	Section 2.0
	Sampling design is determined by size of area, limited areas of CS plant locations, funding, and seasonal variations. Lab analysis is dependent on funding, lab accreditation, and EPA approved methods for metal and fluoride analysis.	Section 1.7

1.7.2 Action Limits/Levels

The Shoshone-Bannock Waste Management Act (WMA) implements policies and procedures on regulating and managing hazardous waste on the reservation. As part of ensuring the protection of the environment, the Soil Cleanup Standards were developed pursuant to Section 201(B) of the WMA. This gives the authority to develop standards for hazardous chemicals in the soil. Chemicals in the Soil Cleanup Standards are utilized as action levels to compare contaminant levels in the soil samples obtained sampling (Table 6). Other relevant sources such as USEPA and state screening levels will also be utilized based on whichever value is lower. Vegetation and soil samples will be compared to the fluoride and metal screening levels shown in Table 6.

Comparison of the results to the action levels is important for determining the levels of analytes tolerated based on tribal and federal regulations.

1.8 Special Training Requirements/Certification

All personnel who participate in sampling that may expose them to potentially hazardous substances or to other health and safety hazards must successfully complete the following training courses which are required under OSHA 29 CFR 1910.120(e).

- Hazardous Waste Operations (HAZWOPER) 40-Hour Training Course;
- HAZ-WOPER 8-Hour Annual Refresher Course.
- Three days of supervised on-the-job training in job specific activities; or
- Sampling and Analysis Environmental Training by EPA approved course

Personnel must complete the HAZ-WOPER 40-Hour Training Course *prior to participating in any activities that might expose them to hazardous substances*. Thereafter, the supervising Program staff members who have completed the HAZ-WOPER 40-Hour Training Course must

also complete the HAZ-WOPER 8-Hour Refresher Course during each calendar year of their employment with the Program. The HAZ-WOPER 40-Hour Training Course must be provided by an outside agency, such as the U. S. Environmental Protection Agency or U. S. Department of Energy. The HAZ-WOPER 8-Hour Refresher Course may also be provided by these agencies or Program personnel who are certified to teach the HAZ-WOPER training courses may provide it in-house. The project manager or field manager (supervisor) will train all field team members before sampling will occur. Each member will be issued a copy of the QAPP and the Health and Safety Plan.

1.9 Documents and Records

This QAPP will be reviewed and updated at least once each year, or more often if necessary. It is the Program Manager's responsibility to review, revise, and update the QAPP and to seek advice and comments about necessary or suggested revisions from Program personnel, the U. S. EPA, and other concerned parties. The Program Manager is responsible for distributing approved copies of the QAPP to the persons named in the Distribution List that immediately follows the Table of Contents in this QAPP. A master copy of the approved QAPP will be kept in the Program Manager's office and will be available to all Program personnel for inspection and reference. A copy of the QAPP will also be kept at a designated field location whenever Program personnel are collecting samples or performing extensive reconnaissance at a field site.

Various types of records will be generated and needed to be stored properly. These records will be stored and maintained in the offices where the EWMP resides. If possible, these documents will be scanned and kept on electronic files for accessibility. Hard copies will be stored together in filing cabinet specific for the sampling events in the QAPP. The following list of records that will be generated and maintained by field staff and/or laboratory staff:

Field Forms/logbook consisting of:

- Purpose of Sampling
- Location and Description of sampling point
- Identification of sampling crew
- Sample identification
- Date and time of sampling
- Field measurements
- Observations of site and samples

Electronic Records from:

- Garmin GPS Device
- Niton Field Portable X-Ray Fluorescence
- Video and Still Camera
- Voice Recorder

- Camera Cell Phones

Chain of Custody form (See below)

Fort Hall Indian Reservation
Environmental Waste Management Program
Culturally Significant Vegetation & Soil Sampling QAPP
Draft 3
August 20, 2014

[illegible]

Field Sheet Form (See Below)

Environmental Waste Management Program

Soil & Vegetation Sampling Field Data Form

Site ID _____ **Date/Time** _____

Location **N** _____ **W** _____

Sampling Crew _____

Environmental Parameters	
Temperature (°C)	
Soil pH	
Conductivity (S/m)	
Moisture (%)	

XRF	Sample ID
XRF A	_____ S1
XRF B	_____ V2
XRF C	_____ S3

Plant Characteristics									
Sample ID	_____ - _____ - Veg								
Name/Species									
Part	Root	Bulb	Fruit	Bark	Stem	Leaves	Whole	Other	
Notes									

Soil Characteristics	
Sample ID	_____ - _____ - S
Type	
Color	
Notes	

NOTES

1.9.1 QA Project Plan Distribution

Personnel	Name	Affiliation	Work Phone	Other Phone
Project Manager	Talia Martin	SBT EWMP	208-236-1062	208-251-0592
Field Supervisor	Zannita Fast Horse	SBT EWMP	208-236-1061	208-221-7608
QA /Program Manager	Kelly C. Wright	SBT EWMP	208-236-1049	208-221-0239
Air Specialist	Penny Weymiller	Air Quality Department	208-478-3853	N/A
Contractor	Ryan Pattie	IAS EnviroChem	208-237-3300	FAX: 208-783-0891

2.0 DATA GENERATION AND ACQUISITION

2.1 Sampling Design (Experimental Design)

The overall goal of this sampling project is to obtain data providing information regarding the uptake of total metals and fluoride in soils and vegetation in the Bottoms and Bannock Creek areas. This sampling event focuses on the uptake of metals and fluoride through transport mechanisms from soil to vegetation. Although some fluoride species detected in plants can be attributed to aerial deposition, specific fluoride complexes are also uptaken from the soil. Metals mobilizing from soil to plant are predominantly water-soluble ions (Radulović, 2002). For this reason we utilize laboratory methods adequate for detecting water-soluble ions in environmental media (See Section 2.4).

To assess the uptake of metals and fluorides, the samples will be analyzed for total metal and fluoride concentrations in soil and vegetation. These samples will be collected for quantitative analyses at an IAS laboratory. Collocated vegetation and soil samples will be taken during each sampling round in August and September. Each sampling event will be comprised of seven (7) soil and seven (7) vegetation samples. For quality assurance, two (2) duplicates will also be collected: 1 soil and 1 vegetative duplicate samples. Two rounds of sampling occurring in August and September for a total of 32 samples collected (14 soil samples, 14 vegetation samples, and 2 duplicates total). For our purposes, the following definitions will be used in during the aforementioned sampling events:

- *Native Vegetation* – any type of vegetation sampled in its native environment.
- *Culturally Significant Plant* – any type of vegetation traditionally used for medicinal, edible, and spiritual purposes by the indigenous populations, Shoshone and Bannocks.

The specific metals that require laboratory analysis of soil and vegetation samples are as follows:

Metals

Aluminum	Lead	Chromium	Silver
Antimony	Manganese	Cobalt	Thallium
Arsenic	Mercury	Copper	Uranium
Barium	Molybdenum	Iron	Vanadium
Beryllium	Nickel	Zinc	
Cadmium	Selenium		

Sampling of the vegetation is based on the type of plant and which part is significantly used by the majority of the users. The following culturally significant plants listed in the table were compiled based on indigenous knowledge and resources (vegetation database, 2014). These plant types among others will be sampled in this sampling plan (Table 5).

Duplicate samples are taken each sampling round for quality assurance purposes. The duplicate samples for soil and vegetation are analyzed with the same methods and for the same analytes on Table 4.

Collection procedures used must not alter the medium being sampled; therefore, the potential for contamination during sample collection and sample processing will be minimized by use of “clean” techniques within the limitations of the sampling methods. Sample handling will also be minimized. All sampling personnel will wear clean, non-talc latex gloves. Unnecessary exposure of the samples to the atmosphere will be avoided to reduce the potential for contamination from atmospheric particulates. Sampling devices will be constructed of non-leaching material and all medium contact surfaces will be of non-leaching materials.

The general principles of contamination control include the following:

- Use of non-talc gloves during sample collection and processing
- Use of pre-cleaned, disposable, or acid-cleaned sample containers
- Use of reagent grade, trace metals free preservatives
- Proper storage of cleaned sampling equipment and sample containers to prevent exposure to atmospheric particulates
- Maintenance of clean work surfaces and work areas during sampling and sample handling.

Because all sample bottles and containers provided by the analytical laboratory will be new, pre-cleaned, no equipment decontamination is expected to be required in the field. If decontamination of field equipment is required, the following procedure for decontaminating equipment that contacts samples will be employed:

General Decontaminating Procedures:

1. Wash with phosphate-free detergent solution
2. Rinse with deionized water (control water)
3. Rinse with 10 % Nitric Acid (desorbing agent)
4. Rinse with deionized water.

2.1.1 Summary of Project Timeline

The following table is a summary of the projects sampling, analytical, and gardening tasks occurring during the project timeline.

Table 3. Summary and Timeline Project Tasks

Tasks	Month when tasks are completed		
	May - June	June & September	September - October
Sampling Tasks:	Site Reconnaissance	Sample 14 Native Plants & 14 Soils	Data Validation/Verification
Laboratory Analysis Tasks:	None	Metals & Fluorides	None
Quality Control Tasks:	N/A	2 Soil and 2 Vegetation Field Duplicates	QA/QC sample data validation/Verification
Secondary Data:	None	3 XRF of Soils/Site	QA/QC sample data validation/Verification
Other Data:	Environmental Parameters	Environmental Parameters	None
Data Management Tasks:	Program will compile environmental data	Program will conduct QA/QC and Compile data	Program will compile data & report
Documentation and Records:	Field log	Chain of Custody Field Forms	N/A

2.1.1 Sample Locations

Sampling locations are determined based on three determining criterion: 1) previous data confirming locations where there is a presence of elevated metals and fluorides 2) cultural knowledge about where the highest activity of CS plant gathering occurs during July to September.

Table 5 provides the locations and coordinates of the sampling sites throughout the reservation where soil and vegetation samples will be taken. The actual sampling sites may vary due to site conditions. Depending on the weather conditions, samples may be collected in a single day or over a period of several days, and sample collection at a given location might be repeated at different times if seasonal variation or other factors are expected to cause temporal variation in the data.

Sampling locations will consist of fields and pasture lands as well as undeveloped land plots, such as riparian areas and sage steppe. Sampling sites will be selected to achieve geographical distribution and availability. Sites that meet distribution and availability criteria will also be selected to give a wide variety of vegetative communities. Sites chosen for sampling will have location documented on field sheet forms. GPS locations will be recorded in decimal degree format for each sampling site and event.

In addition to samples collected for quantitative analyses at a laboratory, the Program will also collect measurements in the field using the Portable XRF (X-ray fluorescence) instrument. The XRF is used for screening during site reconnaissance prior to collection of the soil and vegetation. The use of XRF data will be assessed according to the RPD% between field and lab analysis.

2.2 Sampling Methods

The Program will utilize a combination of guidance documents and ASTM standards for the following activities: sampling techniques, QA/QC protocols for sample collection, documentation and packaging of samples, custody of samples, shipment of samples to laboratories, planning sampling events, and analyzing sample data, documentation and packaging of samples.

2.2.1 Sampling Methods for Soils

Soil sampling will employ judgmental sampling for determining locations. A modification of the

Incremental Sampling Methodology (ISM) approach will also be employed for composite sampling soils along the perimeter of the targeted CS vegetation. ISM is designed to provide a representative concentration of the COPCs within a defined volume. This improves the accuracy and precision of the soil sample being tested. The guidance document, *Incremental Sampling Methodology (ITRC, 2012)* will be followed for soil sampling. Employing ISM to the small area will result in average of concentrations in an area depending on the heterogeneity of the strata. This will be more evident in the results of the duplicates upon analysis.

Soil augers are premier tool for shallow depth exploration (0-12 inches). This method in combination with ISM is beneficial for quantity accuracy and reduction of errors in field sampling and laboratory analyses. The soil standard for soil sampling utilizing a soil auger is referenced in ASTM D14521 – 09 “*Standard Practice for Soil Exploration and Sampling by Auger Borings*”

Additional tools for soil sampling is also achieved by employing various sampling devices such as dedicated stainless steel bowls and Steel Trowels or plastic (disposable) Trowels, personal protection equipment. Where scoops are used, ASTM standard D5633-04 “Standard Practice for Sampling with a Scoop” may be followed for reproducible technique. Other types of soil core samplers can be used depending on the soil conditions.

In some cases it may be necessary to characterize soils and documenting in the field logbooks. Useful resources for characterization of soils include such standard references as *Munsell Soil Color Charts (Macbeth, 1992)*. Such documentation may be in written form in field logbooks or Memos to File, and it may include dated photographs, as well as descriptions of the soil. Parameters and characteristics associated with each sample taken must be logged and recorded on the field forms and field books.

2.2.2 Material Required for Soil Sampling

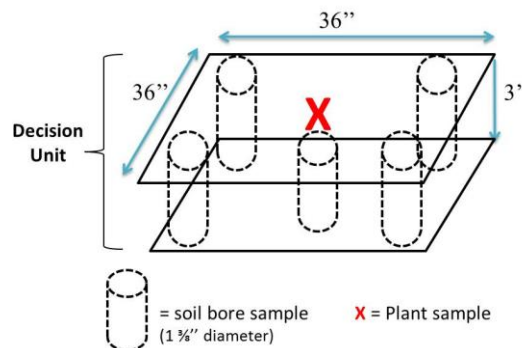
- Soil Auger and extension pole
- Soil pH meter
- Soil Conductivity & Temperature Meter
- Measuring Tape
- GPS equipment
- Weighing Scale
- Lab provided container
- Ziploc Bags
- Steel Trowel or Disposable Plastic Trowel
- Sealed container to transfer samples to analysis laboratory

2.2.3 Sampling Protocol for Soils

The Decision Unit (DU) is a pre-determined volume of soil sampled around the perimeter of the plant of interest. At each sampling site (where native plant exists) a DU the size of 3x3 sq ft perimeter will be marked off. A five-part composite soil sample (100 grams total) is collected within the DU and along the perimeter and adjacent to the specific plant species sampled at that site. Figure 1 represents an example of a DU at each site and the subsequent soil borings.

The sample collection protocol consists of employing a soil auger to collect the composite samples within the DU. Collect samples using clean, disposable latex surgical gloves. The soil auger is used to collect soil in 3'' depths at 36'' horizontal intervals. Soil core sample will have 1 $\frac{3}{8}$ '' diameter. Each soil boring is combined in one sample container to make 1 composite sample for the site.

Figure 1. Decision Unit for Soil Sampling



Sample collection will focus on soil particles, not other materials intermixed in the soil matrix. Using hands covered in surgical gloves, remove plant material, roots, pebbles greater than pea size (1/4" diameter), rocks, concrete, etc... from the plastic mixing bowl. Thoroughly mix the soil volume in the plastic bowl with the plastic trowel or glove covered hands. Note the qualities (color, texture, etc.) of the homogenized sample in the field notebook. Soil samples are mixed, but no other physical manipulations are required (i.e. grounded) within the container.

Using the trowel if necessary, place the mixed soil into the lab provided container for metal analysis and fluoride analysis. Total volume will be given to lab, where only a sub-sample of 100 g will be analyzed.

The bag will be properly labeled with:

- Sample label in the form: Site ID-Media type (example: BJB-S for sample from Big Jimmy Bottoms, soil sample) refer to labeling criteria section 2.3
- Date collected
- Time collected
- Samplers Initials

2.2.4 Sampling Methods for Vegetation

Vegetation of interest is determined prior to field sampling and is located by GPS coordinates. A variety of plant types are assessed based on frequency of consumption and cultural uses. A collocated vegetation sample is taken in the same DU as the soil sample.

2.2.5 Materials needed for Vegetation Sampling

All field sampling equipment must be decontaminated prior to sample collection. Material has been identified for use will include, but not limited to:

- Weighing scale
- Scissors, Shear or Knife
- Kraft paper bags with approximate 10 liters capacity
- Perforated Kraft paper bags with an approximate 2 liters capacity
- Sealed container to transfer samples to the analysis laboratory (e.g. cooler)
- Stapler

2.2.6 Sampling Protocol for Vegetation

The DU boundary line is designed to encompass a relatively isolated native plant, i.e. minimal vegetation within the DU. Once the DU perimeter is marked off, 10 subsamples (>100 grams total) are collected from the native plant. The plant part collected for sampling and analysis is selected based on cultural purposes for that particular part. Plant parts of sampled material are categorized as: leaves, roots, or fruits.

A total of 10 sub-samples are taken from each plant. For samples consisting of leaves, each sub-sample consists of a handful of forage cut with scissors or a knife approximately 5 cm above the

ground, or in some circumstances the top 15 cm of the plant is usually collected.

During the sampling, the sub-samples are cut into 3-5 cm pieces and placed in 10 liters paper bag. The total sample is then well mixed and a sufficient amount is collected to fill half a 2 liter bag. The bags must be perforated for air to circulate, then stapled or sealed. To avoid contamination, a new 10 liter bag must be used for each sample.

The bag will be properly labeled with:

- Sample label in the form: Site ID-Sample ID-Media type (example: BJB-FM-V for sample from Big Jimmy Bottoms, Field Mint plant, and vegetation sample) refer to labeling criteria section 2.3
- Date collected
- Time collected
- Samplers Initials

The sample will be placed in a non-iced cooler and held for transport to laboratory. Vegetation will be harvested using freshly cleaned scissors or knife to be cleaned prior to use and between each transect and field location. Scissors or knife will be cleaned with appropriate decontamination solution, followed by rinsing with deionized water. Notes will be made in logbook for each field and at each time of sampling. Each entry will include the following information: Field location, date of sampling, time of day, general weather conditions (temperature and precipitation), forage type, signs of grazing, signs of cutting and notes on plant vigor based on leaf color and signs of stress of vegetation.

NOTE: It is strongly recommended that plants be collected after raindrops or dewdrops have evaporated to limit dissolution of the fluorides.

2.2.7 Monitoring Heavy Metals by X-Ray Fluorescence: EPA Method 6200

In Situ Analyzing, Ex-Situ Analysis

Thermo Scientific NITON XRF analyzers will be used to test bagged or prepared samples. Measuring bagged samples roughly homogenizes the samples, generally making them more representatives of the locations where they were collected. For true lab-grade analytical data, full sample preparation (dried, ground, sifted, and cupped) is called for, frequently resulting in correlations with lab data with $r^2 \geq 0.98$.

Either way, the NITON's portable test stand readily accommodates various sample types, while permitting viewing and control directly from the instrument or from a connected PC or PDA with the included NDT (NITON Data Transfer) software. Robust software eliminates the need

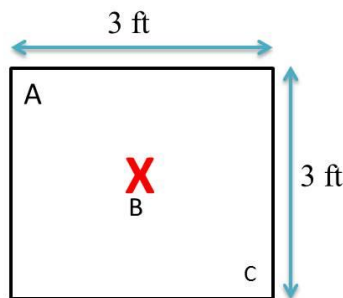
for site-specific calibration standards, while flexible capabilities permit users to fine-tune calibrations as required to meet data quality objectives (DQO's).

All measurements are non-destructive. Following standard protocol, only 5% of all samples are sent to an accredited laboratory for confirmatory analysis. By screening samples prior to collection, environmental professionals will eliminate the testing of high-concentration samples during confirmatory testing.

During the two month sampling, an estimated 15% to 20% of the XRF samples will be sent in for further laboratory analysis. During each cycle of testing, 6 samples will be sent to the laboratory, which will consist of 3 vegetation samples and 3 soil samples.

3 XRF samples (A-C) will be taken along the 3 x 3 perimeter and the plant in the middle (red x). The XRF samples will be taken as Figure 2 displays

Figure 2. XRF sampling points



2.3 Sample Handling and Custody (EPA QA/R-5 B3)

The Program will follow EPA protocols for the documentation, packaging, shipment, and custody of all samples to be sent to lab for analyses.

The Program will ship its samples in accordance with EPA guidance (**EPA, 1996a**) and U. S. Department of Transportation regulations. The Program will deliver samples directly to the lab.

The Program will maintain constant custody of all samples from the time they are collected in the field until they are delivered to the lab. This means that samples will always be in the possession of, or within the sight of, at least one Program staff member at all times.

The Program will keep detailed written records of each sample collected. Samples will be labeled according by the following for consistency:

- Sample ID
- Site Location
- Media type Veg = vegetation or S= Soil
- Date and Time collected

2.4 Analytical Methods

The Program will request routine turnaround times for sample analysis unless otherwise specified in a lab space request form. Problems resulting from paperwork errors, sample shipment errors, breakage of sample bottles during delivery, or other problems will be resolved by normal procedures. The Program Manager or other Program staff member will work with the laboratory management in resolving such problems. Similar problems involving the lab may be resolved in one of two ways: (1) by direct communication between the Program and the lab; or (2) by the Program communicating indirectly with the lab through appropriate EPA officials, as when it is desirable that the lab not know information about the project site or about the client (the Program). The Program will document its communications with the lab, , as well as decisions pertaining to problem resolution, in memos-to-file or in letters on Shoshone-Bannock letterhead stationery, as necessary.

2.4.1 Field Measurements Methods

The Program will not perform gravimetric, GCMS or other similarly complex laboratory analyses of samples itself. The following field instruments are used to determine environmental parameters:

Field Instrument	Environmental Parameter
Hanna Soil pH Test Kit	Soil pH
Hanna Direct Soil Conductivity& Temperature Meter	soil conductivity & temperature
Precision Weigh Balance	weigh samples for accuracy

The environmental measurements for soil pH, conductivity and temperature are important for assessing conditions during the sampling of the plants. This data is useful for assessing the uptake conditions during sampling only. Since we are only quantifying total metals, these environmental parameters are only used for qualitative baseline observations. Data will not be used to speculate about types of metal species detected or soil-plant transfer rates. Any trends observed amongst these parameters will be acknowledged.

2.4.2 Laboratory Analyses Methods

The methods used to analyze soil and vegetation for total metals and fluoride is displayed in Table 3. The laboratory method for analyzing total metal concentration is EPA approved method 200.8, adequate for dissolved metals. Fluoride lab analysis employs EPA approved method 300.0, adequate for water-soluble fluoride complexes.

Table 4. Preservation and analyses of metals and fluoride in soils and vegetation.

Metals							
Analyte	Lab Analyses ^c	Holding Time ^a (4 °C)		Preservative		Sample Container ^b	
		Soil	Vegetation	Soil	Vegetation	Soil	Vegetation
Aluminum	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Antimony	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Arsenic	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Barium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Beryllium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Cadmium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag

Chromium (total)	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Cobalt	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Copper	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Iron	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Lead	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Manganese	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Mercury (elemental)	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Molybdenum	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Nickel	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Selenium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Silver	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Thallium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Uranium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Vanadium	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Zinc	200.8	<6 months	<6 months	None	None	Ziploc Bag	Paper Bag
Fluoride	300.0	<28 days	<28 days	None	None	Ziploc Bag	Paper Bag

Notes

- a. Times are based on IAS recommendation for optimum detection.
- b. 100 g of soil in 1 gallon Ziploc Bag and 100 g of vegetation in 5 x 3 1/4 x 9 3/4" Paper Bag.
- c. Laboratory methods are established EPA methods

2.5 Quality Control Requirements

The Program will collect quality control duplicate field samples in accordance with the *Sampler's Guide to the Contract Laboratory Program (EPA, 1996a)*. The Program will

complete 1 duplicate sample for every 10 samples for both soil and vegetation. Additionally, 1 split sample per 10 samples will be obtained for soil and vegetation.

2.6 Instrument/Equipment Testing, Inspection, and Maintenance

All field equipment will be inspected prior to sampling activities to ensure that proper use requirements are met. Inspection of field equipment will occur in advance of the field operation to allow time for replacement or repair of defective equipment, and the field team will be equipped with proper backup equipment to prevent lost time on site. One member of each field team will gather and inspect all equipment on the equipment and supply list prior to each sampling event. Individual inspections must be documented in the field notes or notebooks prior to sampling activities. Standard Operating Procedures (SOP) for field equipment are provided in Appendix C.

2.7 Instrument/Equipment Calibration and Frequency

The equipment requiring calibration will be calibrated prior to that day's sampling event. The type of equipment needed to be calibrated is the XRF, pH meter, conductivity & temperature meter and will be calibrated according to the manufacturer's operating instruction. At end of each day all instruments will be checked to confirm correct working order.

2.8 Inspection/Acceptance Requirements for Supplies and Consumables

Careful and thorough planning is necessary to ensure the efficient and effective completion of the field sample collection task. It will be the responsibility of the field team to gather and inspect the necessary sampling gear prior to the sampling event and to inspect the sampling packaging and shipping supplies prior to entering the field. Defective packaging and shipping supplies (e.g., torn, soiled, or damaged plastic) will be discarded. All consumable will be inspected prior to entering the field.

2.9 Data Acquisition Requirements (Non-Direct Measurements)

The program will gather a wide variety of supporting data from various sources. These data are gathered from published sources, existing databases, direct observations, and interviews rather than from direct measurements made by the Program. Such data may include, but are not limited to, the following: legal records and land ownership records obtained from county courthouses, the Bureau of Indian Affairs, tribal entities, and other sources; USGS topographic maps obtained as hard copies or from electronic databases; county highway maps; U. S. Fish and Wildlife Service national wetlands inventory maps; Federal Emergency Management Agency flood

insurance rate maps; Sanborne Fire Insurance maps; geologic maps; hydrologic and hydrogeologic resources maps; aerial photographs; Soil Conservation Service county soil survey reports; rainfall frequency records; municipal and rural water system records; state surface water quality standards; utility maps and records; population census data; natural heritage inventories of endangered and threatened species; archives of government agencies, such as the EPA and the Idaho Department of Environmental Quality; public libraries; museum records; scientific papers; reference publications; newspaper articles; historical photographs; the internet and other electronic databases; and personal interviews. The quality and reliability of these data may vary widely, depending on their source, and the Program will have to judge whether particular data meet the data quality requirements of a given project.

2.10 Data Management

Program personnel collect data from a variety of sources, such as site visits, government files, libraries, electronic databases, contractor's reports, and personal communication. The Program itself may generate other data, such as Arc-view maps, statistical analyses, groundwater model outputs, and human health risk assessments. All such raw, processed, or supporting data will remain in the possession of the Program and will be analyzed and compiled into reports by Program personnel.

Data collected or generated by the Program for active or ongoing projects is stored in the form of hard copies or in electronic databases in file cabinets or databases that are dedicated to active projects. Such files and databases may be in central locations in the Program office, such as in dedicated file cabinets or in the server unit for the Program computer network, or they may be in the files of individual Program personnel who are working on those projects. All active and inactive files are stored in file cabinets that can be locked and/or in offices that can be locked, as well as in electronic databases with secure passwords that are changed annually or as needed.

All such raw, processed, or supporting data will remain in the possession of the Program and will be analyzed and compiled into reports by Program personnel. Draft reports will be reviewed and edited by the Program Manager and/or the designated Program Quality Assurance Officer or to being sent to the EPA, the affected tribal entities, and selected other parties for further review and comment.

3.0 ASSESSMENT AND OVERSIGHT

3.1 Assessments/Oversight and Response Actions

The progress of sampling program will continually be evaluated by the staff and final decisions

will be made by the Program Manager. All activities are evaluated to ensure that they meet program, regulatory, and data quality requirements. The activities subject to such management level review and approval include, but are not limited to, site reconnaissance, sample collection, the evaluation of laboratory sample data, statistical analyses of data, data processing the calibration, inspection, and maintenance of monitoring instruments and equipment, the requisition and acceptance of supplies and equipment, the work of contractors, data management, audits of data quality, technical systems audits, and performance evaluations.

In addition to ensuring activities are meeting regulatory and program requirements the Program will also evaluate on a continuing basis:

- Provide training and maintain records of up dated training programs
- Staff meetings and peer reviews, involving any two or more members of the Program management and technical staff, may also be used to assess the effectiveness activities in meeting data quality requirements and project goals
- The Program Manager may delegate responsibility for some of these decisions to the Program Health and Safety Officer or the designated Program QA/QC Officer. In addition, authority for certain data quality decisions that must be made in the field (such as the depth at which a monitoring well should be screened, or a change from the planned location of a monitoring well or other sample location) may be delegated to a Program field team leader.

3.2 Reports to Management

Program staff will submit verbal or written reports to the Program Manager about the status of projects and any problems that have been encountered. The Program Manager and/or the designated alternate will advise the staff of any necessary corrections and of project priorities, timetables, and data quality requirements. The Program Manager and staff will communicate directly with the EPA and the Shoshone Bannock Tribes member(s), and FHBC of concern about the status of projects, about any problems that may need to be resolved, and about any assistance that may be needed.

4.0 DATA REVIEW AND USABILITY

4.1 Data Review, Verification, and Validation Requirements

Data generated in the field by staff will be verified by the field leader prior to leaving the site.

Data generated and analyzed by the laboratory will be reviewed by the Program manager and project QA officer to interpret and determine if QAPP objectives were met. The laboratory must provide the Program with sufficient QA/QC documentation to allow the Program to determine if data received from the lab meets the Program's data quality requirements.

4.2 Verification and Validation Methods

Data verification will be completed by staff to verify that the data quality objectives in Section 1.7 are met. Corrective measures will be taken for data that do not meet the DQOs in Section 1.7. Further data analysis will be done by the staff in cooperation with the laboratory in order to meet the DQOs. Verification is completed by meeting the following activities, but not limited to:

- 1) Reviews of data packages to determine if they meet the contractual requirements in the applicable Statements of Work, and other applicable contractual requirements;
- (2) Reviews of data submitted to, or work performed for, the Program by a contractor (such as a well driller, geophysicist, statistician, or groundwater modeler) to determine if such data meet the requirements in a contract between the Program and that contractor; and
- (3) Reviews of data collected or generated by the Program to determine if such data meet the requirements of this QAPP.

Data validation will also be completed by scientists and staff. The validation process will be completed to determine if the statistical uncertainty of a data set falls within the required decision error limits for a specific project. The complete amount of raw data in the deliverables will be assessed and validated according to the DQOs.

4.3 Reconciliation with User Requirements

The Program Manager and associated staff will determine the usability of the data generated from the field and the laboratory. Their decisions must be based on the criteria discussed in Section 1.7. Any modifications made to documents or activities must be implemented by consulting the sampling team, management, and/or laboratory personnel depending on the changes that must be made. Such decisions will be documented in writing by the Program. Such documentation may be in the form of memos, letters, faxes, modified Site Health, Safety, and Sampling Plans, revisions or amendments to project work plans, revisions to contracts with labs or other contractors, and other written records. Such documentation will explain the following:

- (1) Decisions that are being made and the reasons for those decisions;
- (2) How those decisions may modify the project work plan or the use of project data;
- (3) Expected benefits of those decisions and any consequent modifications;

- (4) Any modifications to the project work schedule; and
- (5) Any limitations on the use of project data.

Such documentation will be retained in Program files, and copies of such documentation will be distributed to the EPA, the affected tribal entities, and other agencies, as necessary.

Revisions and modifications to contracts must be approved by the Program Manager, who will notify the contractor, the EPA, the affected tribal entities, and other agencies, as necessary, of the revisions and modifications.

5.0 REFERENCES

ASTM D14521 – 09 “*Standard Practice for Soil Exploration and Sampling by Auger Borings*”
Current edition approved October 1, 2008. November 2008.

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- U. S. Environmental Protection Agency, 1998d. *Guidance for Data Quality Assessment: Practical Methods for Data Analysis; EPA QA/G-9*. Washington, D. C., EPA/600/R-96/084, January, 1998.
- U. S. Environmental Protection Agency, *Data Quality Objectives Process for Hazardous Waste Site Investigations, EPA QA/G-4HW, Final*. EPA/600/R-00/007, January, 2000.
- U. S. Government Printing Office, Washington, D. C., *Environmental Protection Agency, 40 CFR Part 300, Hazard Ranking System, Final Rule*. Federal Register, Vol. 55, No. 241, December 14, 1990.

FIGURES AND TABLE

Table 5.Vegetation and collocated soil site locations for 2014 Sampling.

ID	Common Name	Scientific Name	Sampled Plant Part	Sampling Sites		Location (decimal degrees)		Sampling Rationale ^a
				ID	Name	N	W	
FM	Field Mint	Mentha arvensis L.	leaves	BJB	Big Jimmy - Bottoms	43.0213	-112.60278	Hunting and Veg Gathering Area
				BC	Bannock Creek	42.87781	-112.63196	Culturally Sensitive Area for gathering
WS	White Sage	Artemisia	leaves	DC	Diggie Creek	43.09762	-112.517580	High Fluoride in vegetation; High As and Cr in Soil (2013); High volume of people in summer months
DP	Desert Parsley	Lomatium dissectum	Root	CB-1	Cedars - Bottoms	43.008362	-112.517672	Veg Gathering Area
JU	Juniper	Juniperus spp	leaves	BP	Bannock Peak	42.639653	-112.681714	Hunting and Veg Gathering Area
				PR-Res	Portneuf River-Reservation Road	42.959843	-112.556804	Veg Gathering Area
RB	Rabbit Brush	Chrysothamnus nauseosus	leaves	AVR3	Arbon valley	42.772	-112.628	High Fluoride in vegetation; Hunting and Gathering Area;
				AVR2	Arbon valley	42.802	-112.573	High Cr in Vegetation; High As in Soil
CA	Cactus	Cactaceae	whole	BP2	Bannock Peak	42.68903	-112.650058	Hunting and Veg Gathering Area
AI	Alfalfa	Medicago L.	whole	PR	Portneuf River	42.923994	-112.546149	High Cr in Vegetation; High As, Cd in Soil
SB	Sage Brush	Artemisia tridentata	leaves	OAV	Old Arbon Valley Rd	42.925451	-112.633757	Gathering Area
				MC4	Michaud Creek	42.834925	-112.548558	High Fluoride in vegetation
TU	Tule	Schoenoplectus acutus	whole	SC	Spring Creek-Bottoms	43.002198	-112.602580	Culturally Sensitive Area for gathering
GR	Grasses	Mixture	whole	Pol1	Pole Line Rd	42.973011	-112.468985	High Fluoride, Cr in Veg; High As, Cr in Soil

Figure 3. Map of Sampling Sites

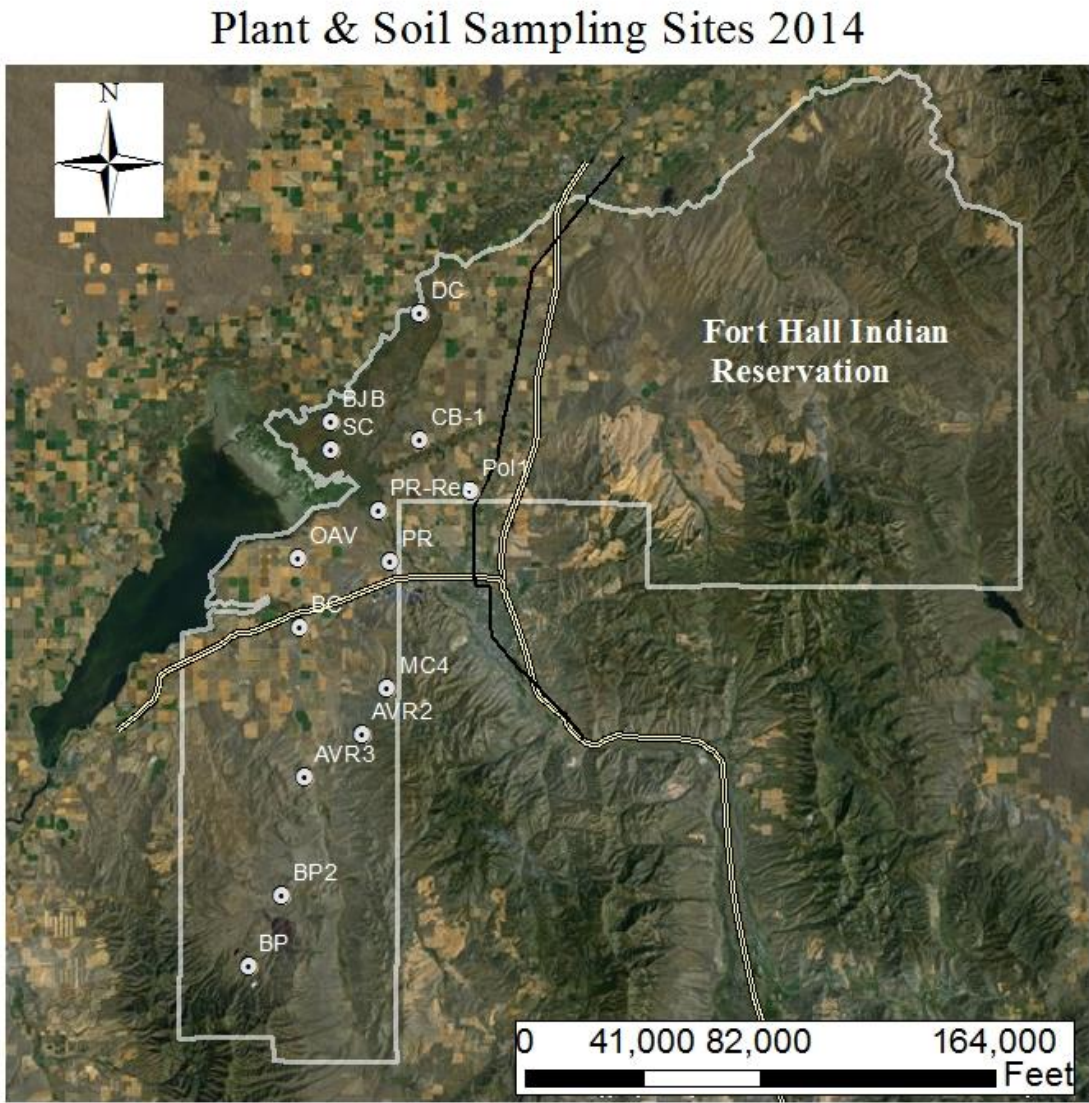


Table 6. Screening Levels for COPCs in soil and vegetation.

Analyte	Soil Screening Level ^{a,b,d}	Vegetation Screening Level ^{a,c}	Reporting Limits		Standard Reference Material
			Lab Analysis Method 200.8	XRF Analysis Method 6200	
Aluminum	77000	1000	1.000	--	NIST-3101a
Antimony	0.27	5.41	0.001	40	NIST-3102a
Arsenic	0.39	23.6	0.001	40	NIST-3103a
Barium	750	--	0.001	20	NIST-3104a
Beryllium	4	--	0.001	--	NIST-3105a
Cadmium	0.36	10	0.001	100	NIST-3108
Chromium (total)	0.4	20.7	0.001	150	NIST-3112a
Cobalt	13	1.29	0.001	60	NIST-3113
Copper	28	20.1	0.001	50	NIST-3114
Iron	55000	500	1.000	60	NIST-3126a
Lead	400	100	0.001	20	NIST-3128
Manganese	220	1,170	0.001	70	NIST-3132
Mercury (elemental)	0.1	0.128	0.001	30	NIST-3133
Molybdenum	2	5	0.001	10	NIST-3134
Nickel	38	66	0.001	50	NIST-3136
Selenium	0.52	5	0.001	40	NIST-3149
Silver	4.2	38.2	0.001	70	NIST-3151
Thallium	1.25	3.83	0.001	20	NIST-3158
Uranium	5	2.75	0.001	--	NIST-3100
Vanadium	2	25.2	0.001	50	NIST-3165
Zinc	46	363	0.001	50	NIST-3168
Fluoride	3,100	25 ^e	4.000 ^h	--	NIST-2695

Notes:

- a. Shoshone-Bannock Tribes' WMA Clean Up Standards
- b. USEPA Regional Screening Levels for Soil, Residential (USEPA, 2013a)
- c. Mineral tolerance of animals, 2nd revised edition (NRC, 2005)
- d. Sources of soil-based benchmarks for evaluating potential effects of COPECs on lower trophic-level organisms include:
 - 1. USEPA Eco-SSLs (USEPA, various dates).
 - 2. ORNL (1996a, 1996b, 1997a, 1997b, 1997c).
 - 3. Environmental Residue Effects Database (ERED) (USACE, 2010).
 - 4. USEPA Ecotox Database (USEPA, 2013c).
 - 5. Aquatox (USEPA, 2009d)
- e. Risk Assessment Information System Calculator Default Value for Farmers
- f. -- Method doesn't detect analyte
- g. All units are mg/kg
- h. Method reporting limit for fluorides by IC

APPENDIX A

FORT HALL INDIAN RESERVATION HEALTH AND SAFETY PLAN

GENERAL INFORMATION

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of the Site Health and Safety Plan (HASP) is to define the requirements and designated protocols to be followed at the sampling sites located on the Fort Hall Indian Reservation during field work activities performed to support the sampling of sediments and surface water. Applicability extends to all employees, subcontractors, and visitors.

The plan assigns personnel responsibilities, prescribes mandatory operating procedures, establishes personal protective equipment (PPE) requirements and describes actions to be taken during a Site emergency. The plan has been prepared to comply with the requirements of 29 CFR 1910.120 (b)(4) and Shoshone Bannock Tribes Health and Safety Program plan. In addition, requirements of the Environmental Protection Agency (EPA) Occupational Health and Safety Manual and EPA Interim Standard Operating Safety Guide will be followed.

The provisions of this plan are mandatory for all personnel assigned to the project, including all employees, subcontractors, and visitors. A copy of this plan will be made available to all Shoshone Bannock Tribes Environmental Waste Management Programs (SBT EWMP) personnel, contractors, subcontractors and authorized visitors that may enter work areas; said personnel will also sign the HASP review form. This plan does not apply to the EPA, State of Idaho, Shoshone-Bannock Tribes personnel or their on-Site representatives.

All personnel performing work must have received the Occupational Safety and Health Administration (OSHA) 40-hour HAZWOPER training (29 CFR 1910.120). HAZWOPER training certificates will be maintained the Field Supervisor (acting as the Site Health and Safety Officer). Those personnel must be involved in the communication and understanding of potential chemical hazards through a Hazard Communication Program in accordance with the provisions of the OSHA Regulations 29 CFR 1910.1200.

The Shoshone-Bannock Tribes (SBT) has its own health and safety requirements. Personnel must adhere to SBT health and safety requirements at all times when working within the facility area.

This plan also provides for alternate procedures to address changing situations that may arise during field activities. This plan shall be present and readily available during all on-site activities. All personnel working on or visiting work areas at the Site shall be briefed on the HASP and adhere to all provisions of this plan. Any supplemental plans used by subcontractors shall conform to this HASP as a minimum.

All project-related personnel on-site, including subcontractors, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This Site HASP summarizes those hazards and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all Shoshone Bannock Tribes Environmental Waste Management Programs or associated personnel prior to performing field work at the Site.

During development of this plan, consideration was given to current safety standards as defined by the EPA, OSHA, and the National Institute of Occupational Safety and Health (NIOSH), health effects, and standard for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. The following reference sources have been consulted:

- OSHA 29 CFR 1910.120 and EPA 40 CFR 311
- OSHA/NIOSH/EPA/United States Coast Guard (USCG) Occupational Health and Safety Guidelines
- NIOSH Pocket Guide to Chemical Hazards
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values

This plan has been developed using the historical information and the analytical data available. As additional information is collected, this HASP may be updated to reflect new hazard analysis and new health and safety program requirements.

Overall Hazard is: High: _____ Moderate: _____
Low: X Unknown: _____

1.2 Site Description

The water systems of interest are located within the boundaries of the Fort Hall Indian Reservation, Fort Hall, Idaho. One major water system, is geographically characterized as a wetland which give rise to adjacent springs and streams within the Reservation. There is also a variety of flora and fauna, such as sagebrush and willows. The ecology provides ideal habitats for a mixture of animals including, coyotes and hawks. These rivers and streams are known as an excellent area for recreational uses such as, fishing for trout and swimming area for members of the Shoshone-Bannock Tribe.

The atmosphere and ecology on the Reservation also provides uses for agricultural activities and cultural resources. Agricultural activities include grazing cattle, horses, and buffalo. Additionally, as part of the indigenous homeland of Shoshones and Bannocks, the area is a vast land that holds a large amount of flora which is used for ceremonial, medicinal, and consumption. There are residential properties and a consistent flux of humans entering and leaving these water systems on a daily basis for recreational, agricultural and gathering depending on the season.

1.3 Work Description

Field work at sampling sites on the Reservation will involve a variety of activities. As currently anticipated, those activities will include:

- Soil Sampling
- Vegetation Sampling
- Test Garden preparation and maintenance

For specific details on the field work to be completed refer to the work plan for the field activities performed. If future field work contains activities that are not described in this Health and Safety Plan, a plan addendum may be necessary to cover additional hazards and risks related to that work.

1.4 Plan Revisions

The procedures presented herein are intended to serve as guidelines. They are not a substitute for the sound judgment of on-Site personnel. Work conditions may change as the project progresses. As appropriate, the plan will be modified by the Project Manager and reissued. Prompt notification of changing work conditions requiring possible modification of this plan is the responsibility of the Project Manager. Additional field tasks with unique hazards or risks may also require changes to this plan. In addition, procedures and equipment specified in this plan will be reviewed and updated as new technologies and equipment are developed. In any event, no changes to this plan will be implemented without prior approval of the Project Manager. A list of those persons who have a copy of this plan will be kept by the Field Supervisor.

2.0 Key Personnel

Table 1 – Project Organization

Personnel	Name	Affiliation	Work Phone	Other Phone
Project Manager	Talia Martin	SBT EWMP	208-236-1060	2082510592
Field Supervisor	Zannita Fast Horse	SBT EWMP	208-236-1061	2082217608
Water Specialist	Candon Tanaka	Water Quality Program	208-239-4582	N/A
QA /Program Manager	Kelly Wright	SBT EWMP	208-236-1049	208-221-0239
Air Specialist	Penny Weymiller	Air Quality Department	208-478-3853	N/A

Contractor	Ryan Pattie	IAS EnviroChem	208-237-3300	FAX: 208-783-0891
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2.1 Project Manager

The Project Manager will coordinate all Shoshone Bannock Tribes Environmental Waste Management Programs site activities for the project. The Project Manager will have the responsibility to interface with field personnel, SBT personnel, and any contractors and subcontractors on any health and safety issues, as appropriate. As described in the following sections health and safety issues will be handled by onsite personnel.

The Project Manager's responsibilities include the following:

- Coordinating with the SBT EWMP On-Site Project Manager on all aspects of the SBT health and safety requirements;
- Providing technical input for the pre entry briefing and tailgate safety meetings with field personnel;
- Interfacing between SBT personnel, subcontractors and Shoshone Bannock Tribes Environmental Waste Management Programs regarding health and safety issues which might arise; and
- Verifying that all Shoshone Bannock Tribes Environmental Waste Management Programs employees under his leadership work in a safe manner according to Shoshone Bannock Tribes policies and this HASP.

2.2 Field Supervisor

The Field Supervisor will be designated as the onsite Shoshone Bannock Tribes Environmental Waste Management Programs personnel responsible for all health and safety activities. The Field Supervisor will have the responsibility for implementation of the HASP during actual field operations performed under Shoshone Bannock Tribes Environmental Waste Management Programs supervision. Responsibilities include:

- Conducting the pre-entry briefing with field personnel;
- Informing personnel involved in the field operations of the proper procedures during emergencies;
- Immediately reporting any unusual or unsafe conditions;
- Verifying that all Shoshone Bannock Tribes Environmental Waste Management Programs

employees under leadership work in a safe manner according to Shoshone Bannock policies and this HASP;

- Providing a copy of the HASP to all subcontractors and third party contracts, and informing them or their representatives of any potential safety hazards that exist onsite or that may be identified during normal operations;
- Observing work party members for symptoms of overexposure or stress;
- Conducting daily tailgate safety meetings;
- Performing site audits to verify adherence to the requirements of the HASP; and
- Modifying health and safety equipment/ procedures based on data gathered at worksite.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSES

The anticipated site activities potentially include both physical and chemical hazards. The sections below discuss the hazards that could potentially be encountered during the course of the project. The below sections are not intended to be a comprehensive description of all potential hazards at the site. They are merely intended to give examples of the types of hazards that may be encountered at the site.

3.1 Task Risk Analysis and Hazard Descriptions

The following sections describe specific hazards associated with potential site activities. The protective measures to be implemented during completion of those operations are also identified under Section 5, Personal Protective Equipment.

3.1.1 Soil Sampling

- During soil sampling activities wear the appropriate protective gear for the operation.
- Make sure others on site (especially equipment operators) know where you are and that you maintain line-of-sight contact. During collection of soil samples, minimize contact with soil with your clothing and body.

3.2.1 Physical Hazards

Injuries that may result from these physical hazards can range from simple slip-trip-fall types of accidents to casualties, including fatalities due to moving heavy equipment or electrocution. Injuries resulting from physical hazards can be avoided through the adoption of safe work practices and employing caution when working with machinery. Never put your hands near moving equipment (e.g. cables, pulleys, or automated hammers).

All field personnel shall be conscious of their work environment and should notify the Project Manager or other appropriate supervisory personnel of any unsafe conditions. The Project Manager will be responsible for informing all workers of any physical hazards related to the site. All field personnel should also familiarize themselves with other contractors' safety procedures. Physical

hazards are discussed in the following sections. The protective measures to be implemented during completion of field activities are also identified under Section 5, Personal Protective Equipment.

3.2.1 Cold Stress

Personnel working outdoors in low temperatures, especially at or below 40° Fahrenheit (F), wet conditions, wind speed 5 miles per hour or higher, lack of water, previous cold injuries, and use of tobacco, fatigue and low activity are subject to cold stress. Exposure to extreme cold for a short time causes severe injury to the surface of the body. Areas of the body which have high surface area-to-volume ratio such as fingers, toes, feet and ears are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. Included, in Appendix B, is a wind-chill factor table.

Frostbite

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized as:

- "Frost nip or incipient frostbite" which is characterized by sudden whitening of skin;
- "Superficial frostbite" which is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient; and
- "Deep frostbite" which is characterized by tissue that is cold, pale, and solid.

Factors that contribute to frostbite include handling solvents, tight footwear, use of alcohol, wet clothing, high altitudes and race. African-Americans are three to six times more likely to get frostbite than Caucasians.

Frostbitten skin should never be rubbed since it can result in permanent tissue damage. For frostbite, applying firm pressure with a hand or other warm body part should warm the skin.

Professional medical help should be sought for frostbite cases. First aid responders can begin to warm the affected part by skin-to-skin contact or by submerging in 108 to 110 degree water. Extreme care should be taken since burns due to loss of feeling can happen easily. There will be some pain when thawing begins.

Hypothermia

Hypothermia is the lowering of the core body temperature. Hypothermia is most likely at very cold temperatures but it can occur even at cool temperatures if an individual becomes chilled from rain or

sweat. Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Individuals who are exhausted or undernourished are susceptible to hypothermia its symptoms are usually exhibited in stages:

- Uncontrollable shivering, and feeling cold;
- Slurred or slow speech;
- Memory lapses, poor judgment, and mental confusion;
- Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95° F;
- Unconsciousness, glassy stare, slow pulse, and respiratory rate;
- Freezing of the extremities; and
- Death.

Field activities shall be terminated by the Field Supervisor if initial signs of frostbite or hypothermia exist or if equivalent wind chill temperature is below 0° F. All affected personnel shall be kept warm and receive immediate medical care.

Additional notes to remember:

- Do not rub the frostbitten part;
- Do not use ice, snow, gasoline or anything cold on the frostbitten area;
- Do not use heat lamps or hot water bottles to rewarm the part; and
- Give a warm drink - not coffee, tea, or alcohol.

3.2.2 Heat Stress

When personnel are working in hot environments, the Site Manager and all field personnel should be trained to recognize the symptoms of heat stress and provide initial first aid treatment if required until more qualified personnel take over. Heat stress occurs when the rate of heat gain is greater than the body's ability to remove it. It is important to understand the factors that cause overheating and mechanisms to control those factors. The heat stress education poster is shown in Attachment C will be posted at the work site and reviewed during safety meetings.

Heating of the body occurs from three sources:

- Radiant heating from heat sources or sunlight;
- Convective heating from contact with a warmer object or liquid; and
- Metabolic heating caused by activity.

Cooling occurs through three mechanisms:

- Respiration: Exhaled air is warm. As the body overheats, respiration becomes more rapid;
- Radiation: Heat is released at the surface of the skin. As the body overheats, the surficial blood vessels dilate and allow more heat to be lost; and

- Evaporation: Perspiration is released to the skin surface and evaporates. The skin is cooled by evaporative cooling.

Effects of PPE

Heat stress may occur with or without the use of PPE. PPE adds layers of clothing that insulate the wearer from cooling air. Chemical protective clothing generally has a vapor barrier to keep out chemical vapors. The vapor barrier also prevents evaporative cooling of perspiration. In short, PPE increases the heat stress on workers.

Practical Methods to Reduce Heat Stress:

- Become acclimated to heat for several days whenever possible. Plan work in the cooler portions of the day. Early morning hours and evening hours are cooler.
- Perform Site preparations before the field team dresses out. Instrument calibrations, equipment preparation, and planning for the work day, etc., should be performed before dressing in PPE.
- Take frequent breaks and consume at least one pint of cool fluid every hour. Replenish electrolytes through the consumption of diluted drinks. The body loses more water than electrolytes. Concentrated salt, electrolyte, or juices can increase susceptibility to heat stress.
- Avoid beverages with caffeine, which make the body lose water and increase risk for heat illnesses.

Table 2 – Heat Stress Symptoms and Treatment

CONDITION	COMMON SYMPTOMS	TREATMENT
Slightly elevated body temperature	Body temperature between 99 and 101° F Headache	Drink cool fluids. Rest in cool place until temperature and pulse are below 99°F and 110, respectively.
Heat rash	Rash mainly on back	Shower at the end of the shift. Observe for signs of heat exhaustion.
Heat cramps	Muscle cramps or twitching often starting in abdominal area. Pain in hands, feet and abdominal areas.	Remove from field work. Take off PPE. Encourage consumption of cool fluids designed to replenish electrolytes (e.g., Gatorade). Observe for signs of heat exhaustion.
Heat exhaustion	Body temperature between 99 and 102° F Headache, weakness Elevated pulse Profuse sweating Pale skin Cool wet/clammy skin Lethargic Nausea Dizziness	Act immediately. Remove to a cool shaded area. Take off PPE. Drink cool fluids, about a cup every 15 minutes unless sick to the stomach. Spray with a cool mist of water or apply wet cloth to skin. Treat as a medical emergency if the person does not feel better in a few minutes. No field work for at least 48 hours.
Heat stroke LIFE THREATENING	Temperature greater than 102° F Hot, dry pale skin with no sweating Flushed skin Irritability, confusion, seizures, unconsciousness. Rapid pulse	Treat as a medical emergency. Remove from field work. Remove PPE. Spray with a cool water mist, or apply cool wet cloth to skin, not cold water. Place ice packs under armpits and groin area until emergency medical services arrive. Written release from doctor required to return to work.

Occupational Exposure Standards

The EPA and the ACGIH have published heat stress monitoring recommendations. The EPA recommends heat-stress monitoring at temperatures above 70° F when chemical PPE is used.

The tabulated information assumes that no chemical PPE is being worn. Since chemical PPE tends to increase heat stress, ACGIH has published correction factors in the same standard. OSHA enforces the ACGIH recommendation.

3.2.3 Noise

Personnel working around large construction equipment and loud, congested areas can be exposed to excessive noise causing temporary or permanent damage to hearing. The effects of noise can include:

- workers being startled, annoyed, or distracted;
- physical damage to the ear; and
- Communication impediment that may increase potential hazards.

All personnel shall wear hearing-protective devices (i.e., either ear plugs or muffs) when noise levels interfere with normal speech. Hand signals will be established by on-site personnel, as appropriate, to facilitate communications while involved in high-noise activities.

3.2.4 Weather

It is a Shoshone Bannock Tribes Environmental Waste Management Programs policy that field work be conducted under safe conditions. Rain, snow and/or high wind conditions may occur during the time period of a scheduled work activity, depending upon the location of a given jobsite.

Protective clothing for wet conditions will be utilized as necessary. Heavy rains, high winds or other weather conditions may result in the cessation of site activities, at the discretion of the Project Manager or Field Supervisor.

Outdoor operations will be suspended when lightning is within a 15 second count of the site (i.e., the time difference between seeing a lightning strike and hearing the sound). High profile equipment operation, such as drill rigs, shall be suspended when lightning is within 30 seconds of the site. Equipment operators shall stop their equipment and park it safely before heading for shelter. No personnel will be left on the ground in an exposed location. Preferred shelter during thunderstorms is a permanent building. Personnel may also take shelter in trailers or low profile rubber tired equipment (e.g., pickups). Avoid driving pickups or any other equipment, except to help evacuate personnel.

Thunderstorms always have the potential for down bursts and hail. Weather forecasts should be monitored frequently for changing weather conditions. Work may resume after a 30 minute period

without lightning occurring within the 15 or 30 second count specified.

Extra care must be taken by site workers during snowy weather. Adequate protective clothing must be donned. Site workers must be allowed rest periods in warm shelters at regular intervals. Vehicle speeds on site will be limited to below 10 mph during snowy conditions. All work shall be suspended under blizzard conditions and site workers shall immediately seek warm, sturdy shelters, such as buildings.

3.2.5 Manual Lifting

Activities may require personnel to move large, heavy objects by hand. The human body is subject to severe damage in the forms of back injury and hernia if caution is not observed when handling, lifting, or moving large heavy objects.

General Rules:

- Get a good footing;
- Place feet about one shoulder width apart;
- Bend at knees to grasp weight;
- Keep the back straight; and
- Get a good hold.

3.2.6 Slip, Trip and Fall

Protection from slip, trip and fall hazards will be provided through standard safety procedures including good housekeeping. Removing equipment and debris, and taking general precautions during site operations will be standard operating procedures. Workers will be apprised of any potential trip hazards through regularly scheduled health and safety meetings. Whenever possible, trip and fall hazards will be eliminated or clearly identified with yellow "caution" tape. Impalement hazards to workers will be neutralized as soon as they are identified.

3.2.7 Proximity to Water

Field activities on or near ponds or other surface waters pose a potential drowning hazard. The hazard is addressed in 29 CFR 1926.106: "Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jackets or buoyant work vests." Workers working over water in boats will be required to don a life vest. Workers working near water will not be required to wear life vests; however, life vests will be available within 50 feet of the work activity.

3.2.8 Underground Utilities

Before any excavation activities begin, all utilities (i.e., electricity, natural gas lines, water lines, sewer lines, etc.) should be identified and deactivated as needed. The location of field work should be adjusted to avoid active underground utilities, if possible. The deactivation of utilities, when necessary, should be certified by the proper utility company personnel and the certification record retained. Location of the utilities and any deactivation will be the responsibility of the contractor and will be coordinated with the Project Manager or Field Supervisor.

3.2.9 Fire Prevention

Fire extinguishers shall be provided in the field vehicle and shall be available onsite. All extinguishers will be inspected, serviced, and maintained. Inspections shall be recorded on the inspection tag attached to each extinguisher.

3.2.10 Traffic

Vehicle traffic will maintain a safe speed (obey the posted SBT speed limit signs) while operating on site. Occupants of any Shoshone Bannock Tribes Environmental Waste Management Programs vehicle shall wear seatbelts at all times. Vehicles and equipment will be equipped with the safety procedures outlined in 29 CFR 1926.601. Precautions will be made to warn foot traffic or other vehicles as necessary.

3.3 Chemical Hazards

Results from previous sampling performed at the site indicate that contaminant hazards may be encountered at the site during field activities. These hazards include:

- Cadmium and
- Selenium

Data Specific to these chemicals are presented in Tables 4 through 7 and chemical information sheets found in Appendix E.

Chemical substances in gaseous, liquid, or solid form can enter the unprotected worker by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systemically in different parts of the body.

Chemical exposure by inhalation is a concern since the lungs are extremely vulnerable to chemical agents. In addition, substances can pass through lung tissue into the bloodstream and onto other susceptible areas of the body. Since some toxic chemicals are not detectable by human senses, their toxic effects may not produce any immediate symptoms. Respiratory protection is therefore extremely important if there is a possibility that the worksite atmosphere may contain such hazardous substances.

The skin and eyes also represent important routes of exposure. Some chemicals directly affect the skin, while others may pass through the skin into the bloodstream where they can be transported to other vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve on its moist surface and be carried to the rest of the body via capillaries located very close to the surface of the eye. Protection against skin and eye contact may be provided by:

- Wearing protective equipment (i.e., Tyvek coverall suits);
- Wearing protective safety glasses or goggles;
- Avoiding the use of contact lenses in contaminated atmospheres since they may trap chemicals against the eye surface; Keeping hands away from the face; and
- Minimizing contact with liquid and solid chemicals.

Inadvertent ingestion can occur as a result of personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics. These practices may provide a route of entry for chemicals and are restricted.

3.3.1 Other Contaminants of Concern at the Site

Other contaminants may be encountered during the course of the site activities. If unusual odors or conditions are encountered, personnel should suspend work activities and contact the Project Manager for guidance before proceeding.

3.3.2 Other Miscellaneous Items

The major chemical hazards have been discussed above. However, other potential chemical hazards may be encountered during site activities. One potential chemical hazard is laboratory packing chemicals or acid preservatives that may be required for sampling. Also, chemicals used during decontamination, such as Alconox, are irritating to the skin and respiratory system and should be handled appropriately.

3.3.3 General Precautions

If signs of contamination different from those addressed in this HASP are encountered, such as visible soil stains or unusual odors, stop all work in the area, barricade or otherwise isolate the area, and immediately contact the Project Manager. Protection of worker health and safety shall be the first priority. Continuation of work in the area and the amount of additional personal protective equipment, if any, shall be determined by the Project Manager. Other precautions to be undertaken to provide a safe work place on this project where the

potential for chemical exposure may exist include:

- No smoking, eating, or drinking in areas where contaminants may be present;
- Contact with contaminated materials, i.e., groundwater, should be minimized through the knowledge of site conditions and the location of potential contamination based on previous site investigation reports; and
- Adequately barricade or mark-off all work zones to provide for public safety.

3.4 Biological Hazards

3.4.1 Insect Bites and Stings

Insects are present at this Site during warm weather. Although insect bites or stings can be painful, they rarely cause death. However, some people can have a severe allergic reaction to an insect bite or sting that can result in a life threatening condition. The following is a list of preventive measures:

- Apply insect repellent prior to fieldwork and or as often as needed throughout the work shift.
- Wear proper protective clothing (work boots, sock and light colored pants).
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- Field personnel who may have insect allergies should provide this information to the Field Supervisor prior to commencing work.

3.4.2 Tick Bites

The Center for Disease Control (CDC) has noted the increase in Lyme Disease and Rocky Mountain Spotted Fever (RMSF) resulting from bites from infected ticks that live in and near wooded areas, tall grass, and brush. Ticks are small, ranging in size up to about one quarter inch. They are sometimes difficult to see. The tick season extends from spring through summer. When embedded in the skin, they may look like a freckle. Lyme disease has occurred in 43 states, with the heaviest concentrations in the Northeast (Connecticut, Massachusetts, New Jersey, New York, Pennsylvania), the upper Midwest (Minnesota and Wisconsin), and along the northern California coast. It is caused by deer ticks and lone star ticks which have become infected with spirochetes. Deer ticks may range in size from one-eighth inch in size to up to one-quarter inch in size and can be black or brick red in color. Lone star ticks are larger and chestnut brown in color.

RMSF has occurred in 36 states, with the heaviest concentrations in Oklahoma, North Carolina, South Carolina, and Virginia. It is caused by Rocky Mountain wood ticks, and dog ticks which have become infected with rickettsia. Both types of ticks are black in color.

Standard field gear (work boots, socks and light colored coveralls) provides good protection

against tick bites, particularly if the joints are taped.

When wearing field gear and working in the field, check yourself often for ticks, particularly on your lower legs and areas covered with hair. Look for "a freckle that moves". The following precautions should be taken:

- Spray outer clothing, particularly your pant legs and socks, **BUT NOT YOUR SKIN**, with an insect repellent.
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- If you suspect that a tick is present, remove it with tweezers only, and not with matches or a lit cigarette. Grasp the tick with the tweezers and pull gently. If it resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, and then remove it with tweezers. Do not use nail polish or any other type of chemical. Remove all parts of the tick's body. Once removed, disinfect the area with alcohol, or a similar antiseptic.
- Look for signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area on the skin, frequently with a small welt in the center. This rash can appear from several days to several weeks after the tick bite.
- Also look for signs of the onset of RMSF, an inflammation or rash comprising many red spots under the skin, which appear 3 to 10 days after the tick bite. The rash frequently occurs on the ankles and wrists.
- The first symptoms of either disease are flu-like chills, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individual recover fully in a short period of time. If not treated, more serious symptoms can occur.

If you believe you have been bitten by a tick, or if any of the signs and symptoms noted above appear contact the Field Supervisor. The Field Supervisor has the authority to authorize a physician visit for an examination and possible treatment.

3.4.3 Snake Bites

There are poisonous snakes in Southeastern Idaho. If bitten by a snake, remain calm, keep the affected area below the level of the heart and walk, do not run, to the nearest aid station for assistance. The Field Supervisor will designate someone to immediately transport the victim to the closest medical facility for treatment or send for appropriate medical assistance, whichever is faster. The following precautions should be used when working in areas with snakes:

- Wear appropriate protective equipment (snake-proof work boots);
- Be alert and aware of surroundings; and
- Avoid walking in through bushes, tall grass, or brush as much as possible.

3.4.4 Plants

Poison Ivy, sumac and oak may be present on Site. Poison ivy can be found as vines on tree trunks or as upright bushes. Poison ivy consists of three leaflets with notched edges. Two-leaflets form a pair on opposite sides of the stalk, and the third leaflet stands by itself at the tip. Poison ivy is red in the early spring and turns shiny green later in the spring.

Poison sumac can be present in the form of a flat-topped shrub or tree. It has fern-like leaves, which are velvet dark green on top and pale underneath. The branches of immature trees have a velvety “down”. Poison sumac has white, “hairy” berry clusters. Contact with poison ivy, sumac, or oak may lead to a skin rash, characterized by reddened, itchy, blistering skin which needs first aid treatment.

Poison ivy barrier cream and cleanser will be used at the discretion of the Field Supervisor. Site workers will apply the barrier cream prior to working in areas where exposure to the poisonous plants exists. Subsequently, the cleaner will be used at the end of the work shift to remove oils, which remain on the skin from exposure to the plants.

4.0 PERSONNEL TRAINING REQUIREMENTS

4.1 General Training

Prior to initiation of site activities, all Shoshone Bannock Tribes Environmental Waste Management Programs field personnel shall have completed an initial 40 hour Hazardous Materials Health and Safety Course and have a current 8-hour annual refresher course(s), as appropriate. All field personnel shall also have a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor.

The Field Supervisor shall have completed at least eight additional hours of specialized supervisor training as per 29 CFR 1910.120 (e)(4). All courses shall have been conducted by a qualified trainer as specified in 29 CFR 1910.120 (e)(5). These courses should cover chemical hazards, hazard recognition, hazard assessment and personal protective equipment.

All personnel who may participate in the site activities shall be required to have completed appropriate training as specified in 29 CFR 1910.120 (e)(3) prior to the initiation of site activities. The supervisor-training requirement will also apply to the subcontractor supervisors. The subcontractor shall provide Shoshone Bannock Tribes Environmental Waste Management Programs with copies of written certificates documenting said training. Copies of training certificates for on-site personnel will be kept at the site in the possession of the Project Manager during the performance of site activities.

4.2 Site Informational Programs

Prior to the initiation of each phase of field work, all Shoshone Bannock Tribes Environmental Waste Management Programs personnel and subcontractors who will participate in the site investigation shall

attend a pre-entry briefing. The pre-entry briefing will review information contained in this HASP, including:

- Names of personnel responsible for site safety and health;
- Safety and health concerns, including physical and chemical hazards present at the site;
- Use of personal protective equipment;
- Work practices by which the employee can minimize risks from hazards;
- Site control measures;
- Site decontamination procedures;
- Emergency response procedures; and
- Spill containment procedures.

In addition, all persons participating in field activities shall be required to read this HASP and sign the safety compliance agreement form found in Appendix A. Information discussed at the pre-entry briefing will be reinforced, in turn, during tailgate safety meetings (see below). Additional pre-entry briefings may be required for additional phases of work or if new personnel are assigned to the project.

Tailgate safety meetings will be conducted as necessary, or whenever new personnel arrive and/or when a unique work assignment warrants employee training. Tailgate safety meetings will be conducted by the Project Manager or Field Supervisor. These meetings will cover the projected work for the day or the specific task and will review and reinforce good safe work practices (e.g., proper protective clothing, effective deterrents of heat stress, etc.). Information discussed at the tailgate safety meetings may be revised and updated, based on any new data obtained pertaining to site characterization and analyses.

5.0 PERSONAL PROTECTIVE EQUIPMENT

5.1 Personal Protective Equipment Levels

The following sections describe the levels of personal protection for field work at the site. These levels are based upon the physical and chemical hazards at the site (Section 3.0). All site field activities are anticipated to be performed in Level D or modified Level D protection. The level of personal protection worn by field personnel will be defined, controlled, and implemented by the Project Manager. Protection may be upgraded or downgraded by the Project Manager, as deemed necessary throughout the project. Procedures for inspection of PPE are provided in Appendix D.

5.1.1 Level D Personal Protection

Level D personal protective equipment is basic and includes the following:

- Blue jeans, cotton t-shirt with long sleeves;

- Work gloves;
- Steel-toe work boots (conforming to ANSI Standard Z 41.1); and
- Hard hat (conforming to ANSI Standard Z 89.1), as needed.

5.1.2 Modified Level D Personal Protection

Modified Level D personal protective equipment may include the following:

- Blue jeans, cotton t-shirt with long sleeves;
- Work gloves (disposable nitrile or cotton, depending on task);
- Steel-toe work boots (conforming to ANSI Standard Z 41.1) with rubber covers, if necessary;
- Hard hat (conforming to ANSI Standard Z 89.1); as needed
- Safety glasses or sunglasses (conforming to ANSI Standard Z 87.1);
- Hearing protection (when excessive noise greater than 85 dBa is present); as needed
- and disposable Tyvek Coveralls (exchanged when heavily soiled and in between breaks, at least once per work day.) as needed
- Half-face air purifying respirator (Organic vapor/acid mist/HEPA) as needed
- Hearing protection (when excessive noise greater than 85 dBa is present).

5.1.3 Respirator Use

Not anticipated, use as needed.

5.2 PPE Deviation/Modification

Protection levels may be upgraded, downgraded, or modified as deemed necessary by the Field Supervisor based upon work task or site-specific, safety-related factors such as:

- When excessive noise levels exceed 85 dBa;
- Change of season/weather;
- When temperature extremes or individual medical considerations (i.e., heat stress, medication, etc.) limit the effectiveness of PPE
- When visible vapors from the cooling towers enter the work area.

5.3 Limitations of PPE

PPE ensembles designated for use during work tasks have been selected to provide protection against contaminants at known or anticipated concentrations in soil or water matrices. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all

types of chemicals. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protective garment, and the resistance of a garment to a specific contaminant. Chemical permeation may continue even if a garment is resistant to a specific contaminant and may continue even after the source of contamination has been removed from the garment. In order to obtain optimum usage from PPE, the following procedures are to be followed by all site personnel using PPE:

- When using disposable Tyvek coveralls, don a clean, new garment after each rest break or at the beginning of each shift;
- Inspect all clothing, gloves, and boots both prior to and during use for:
 - ~Imperfect seams;
 - ~Nonuniform coatings; Tears; and
 - ~Poorly functioning closure.
- Inspect reusable garments, boots, and gloves both prior to and during use for:
 - ~Visible signs of chemical permeation;
 - ~Swelling;
 - ~Discoloration;
 - ~Stiffness;
 - ~Brittleness;
 - ~Cracks; and
 - ~Any sign of puncture; and any sign of abrasion.
- Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused and will be discarded.

5.4 Donning of PPE

A routine will be established and followed at the site for donning PPE. The procedures will be discussed in detail during the site safety meeting before starting the project and briefly during periodic site safety meetings.

Before wearing any level of PPE, it will be checked that it is in proper condition for the purpose for which it is intended. Also, workers with any minor injuries and/or openings in the skin surface, such as cuts and scratches, will be attended to in order to protect such areas which may potentially enhance exposure effects. Workers with large cuts, rashes, or other such skin damage will not be allowed to don PPE.

6.0 SITE CONTROL MEASURES

The site control measures program is designed to minimize the exposure of personnel to potentially hazardous substances and/or situations. In this section, the term “site” refers to the immediate work

area. This objective will be accomplished by the establishment of work zones, the proper decontamination of personnel and equipment, and proper maintenance of safety equipment. In addition, all SBT and safety requirements will be followed at all times while at the site.

6.1 Work Zone Definitions

Work zones shall be delineated by the contractor. Site personnel will abide by the zones as delineated. If the Field Supervisor does not agree with the zones as designated by the contractor, the project manager will be contacted. There shall be three work zones for the purpose of site control and personal protection. The zones are as described as follows:

Exclusion Zone: The area where contamination is either known or likely to be present, or because of activity, will provide a potential to cause harm to personnel. Entry into the exclusion zone requires the use of personal protective equipment. The exclusion zone for this work is the area in a 50-foot radius from plates.

Decontamination Zone: Personnel performing equipment decontamination will wear personal protective gear. Specific procedures for personnel decontamination are outlined under Section 9, Decontamination Procedures. The contamination reduction zone will be set up adjacent to each exclusion zone.

Support Zone: The area situated in clean areas where the chance to encounter hazardous materials or conditions is minimal. PPE is therefore not required.

6.2 Safe Work Practices

The following general safe work practices will apply during site activities:

- All on-site personnel and any visitors to the site during work activities described in this HASP shall read and sign this safety plan prior to entering and/or working on the site.
- The master copy (with signature sheet) of this safety plan will be held by the designated on-site safety officer.
- No project personnel may be allowed on-site without the prior knowledge and consent of the designated Field Supervisor and Project Manager.
- Project personnel shall bring to the attention of the designated site safety officer any unsafe condition or practice associated with on-site project-related activities.
- Personnel will not eat, chew gum or tobacco, smoke, take medicine or perform any other practice that increases the likelihood of hand-to-mouth transfer of potentially hazardous substances from gloves, unwashed hands or equipment.
- No one is to carry "strike-anywhere" matches or cigar/cigarette lighters.

- Hands, face, and all other potentially contaminated areas shall be thoroughly cleaned prior to eating or leaving the site.

First aid supplies and drinking water will be located onsite.

7.0 DECONTAMINATION PROCEDURES

7.1 Personnel Decontamination Procedures

Decontamination areas will be established prior to initiation of field activities, and the exact decontamination procedures will be established at that time based on field conditions, space considerations, etc.

Examples of decontamination procedures for Level D protection include normal workday procedures including:

- Brush visible dirt from boots;
- Remove gloves, safety glasses, hardhat, and ear plugs/muffs as used;
- Wash hands and face with water and hand soap followed by a potable water rinse; and shower
- Launder personal clothing soon as possible upon completing daily activities.

7.2 Equipment Decontamination Procedures

All equipment that comes into direct contact with potentially contaminated material, surface water or groundwater shall be decontaminated prior to leaving the decontamination zone. Equipment decontamination procedures will consist of the following:

- Physically remove packed dirt and debris with a stiff bristle long handle brush and water.
- Steam clean all potentially contaminated surface areas, if needed.
- Scrub all potentially contaminated surface areas with a water/industrial detergent soap solution.
- Rinse scrub solution off with steam and/or water. Allow to drip and air dry on site.

8.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

SBT emergency response procedures will be followed during the project.

The required elements of an emergency response plan as specified in 29 CFR 1910.120(1) are listed below. As described in the regulation, many of these items primarily pertain to emergency

responses at uncontrolled hazardous waste sites, and thus are not entirely applicable to the anticipated site activities, which do not constitute an emergency response situation. The contractor will be responsible for providing an emergency response plan for their activities. An explanation of how each plan element will be implemented at the site is provided below:

1.) Pre-emergency planning - This emergency response plan will be provided to all personnel, including subcontractor personnel, working on the site during the pre-entry briefing. In addition, emergency response actions will be reviewed with all personnel during the pre-entry briefing and the tailgate safety meetings.

2.) Personnel roles, lines of authority, and communication. The Field Supervisor will be responsible for emergency coordination at all times. Any accidents and/or injuries shall immediately be reported to him. The Field Supervisor will immediately report any accidents to the On-Site Project Manager.

3.) Emergency recognition and prevention - Physical and chemical hazards at the site will be reviewed at the pre-entry briefing and the tailgate safety meetings.

4.) Safe distances and places of refuge - Should emergency conditions arise requiring site evacuation, the Field Supervisor will notify all on-site personnel immediately through the use of hand signals and verbal instructions.

5.) Site security and control - Site security will be provided by the existing fence and natural terrain.

6.) Evacuation routes and procedures - The Field Supervisor will notify all on-site personnel of the need for immediate evacuation. Site evacuation will be performed in an orderly fashion under the direction of the Field Supervisor and proceeding to the nearest evacuation rallying point.

7.) Emergency decontamination procedures - In the event of a medical emergency, personnel decontamination prior to medical treatment may be omitted. Whenever possible, Shoshone Bannock Tribes Environmental Waste Management Programs personnel will accompany contaminated victims to the hospital to advise on matters involving decontamination. If on-site first aid is rendered and the victim does not require transport to the hospital, clothing and equipment decontamination as described in Section 8.0 will be performed after first aid measures have been performed.

8.) Emergency medical treatment and first aid - Based on the severity of the injury/exposure, additional medical treatment will be obtained as described in paragraph 9 below.

9) Emergency alerting and response procedures - The procedures listed below will be used in the event of any site emergency:

- a.) Remove any injured person(s) from immediate danger and administer first aid as needed.
- b.) SBT has Emergency Medical Technicians (EMTs) and ambulance to transport injured persons to the hospital or Indian Health Services. The required procedure is to call (208) 478-3784 which is the Fort Hall Fire EMS District, on a cell phone to activate the emergency response system. If a call to 911 is needed it will be made by the supervisor or responding EMTs. The Field Supervisor will carry a cell phone at all times. Notify Project Manager before resuming work.

10) Any accidents or emergency incidents shall be reported to the relevant local, state and federal agencies by SBT EWMP. The report will include a summary of the emergency, a description of the conditions that led to the emergency, a review of the response actions implemented following the emergency and a discussion of steps that might have been taken to prevent a recurrence of the emergency. In addition, any SBT emergency reporting procedures will be followed. The Project Manager will coordinate with SBT EWMP On-Site Project Manager on follow-up reporting.

11) PPE and emergency equipment - All personnel will be required to have complete Level D, and Modified Level D PPE ensembles available for use when onsite. In addition, the Field Supervisor will have available a first aid kit, a fire extinguisher and possibly a portable eyewash kit.

9.0 CONFINED SPACE ENTRY PROCEDURES

No confined space entry is anticipated during these field activities.

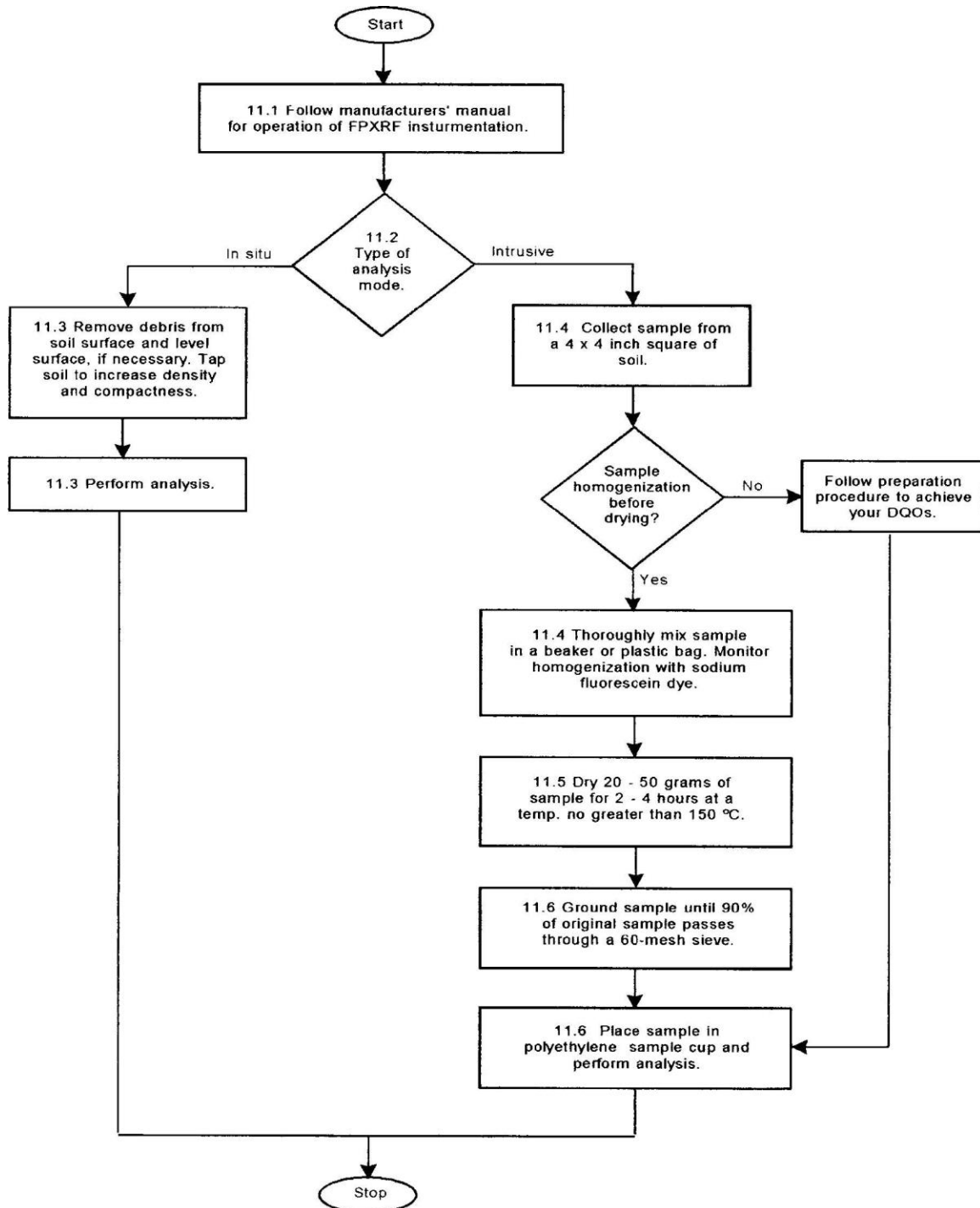
10.0 SPILL CONTAINMENT PROGRAM

Potentially hazardous fluids that may be located on-site during the field activities are unknown. All containerized fluids will be clearly labeled as to their origin and date of generation. If a spill of containerized fluids occurs, the PPE level for response personnel will be modified Level D.

APPENDIX B

METHOD 6200

FIELD PORTABLE X-RAY FLUORESCENCE SPECTROMETRY FOR THE DETERMINATION OF ELEMENTAL CONCENTRATIONS IN SOIL AND SEDIMENT



Fort Hall Indian Reservation
Environmental Waste Management Program
Culturally Significant Vegetation & Soil Sampling QAPP
Draft 3
August 20, 2014

H Hydrogen 1		He Helium 2	
Li Lithium 3		Be Beryllium 4	
Na Sodium 11		Mg Magnesium 12	
K Potassium 19		Ca Calcium 20	
Rb Rubidium 37		Sr Strontium 38	
Cs Cesium 55		Ba Barium 56	
Fr Francium 87		Ra Radium 88	
Sc Scandium 21		Ti Titanium 22	
V Vanadium 23		Cr Chromium 24	
Mn Manganese 25		Fe Iron 26	
Co Cobalt 27		Ni Nickel 28	
Cu Copper 29		Zn Zinc 30	
Ga Gallium 31		Ge Germanium 32	
As Arsenic 33		Se Selenium 34	
Br Bromine 35		Kr Krypton 36	
Y Yttrium 39		Zr Zirconium 40	
Nb Niobium 41		Mo Molybdenum 42	
Tc Technetium 43		Ru Ruthenium 44	
Rh Rhodium 45		Pd Palladium 46	
Ag Silver 47		Cd Cadmium 48	
In Indium 49		Sn Tin 50	
Sb Antimony 51		Te Tellurium 52	
I Iodine 53		Xe Xenon 54	
Hf Hafnium 72		Ta Tantalum 73	
W Tungsten 74		Re Rhenium 75	
Os Osmium 76		Ir Iridium 77	
Pt Platinum 78		Au Gold 79	
Hg Mercury 80		Tl Thallium 81	
Pb Lead 82		Bi Bismuth 83	
Po Polonium 84		At Astatine 85	
Rn Radon 86			
La Lanthanum 57		Ce Cerium 58	
Pr Praseodymium 59		Nd Neodymium 60	
Pm Promethium 61		Sm Samarium 62	
Eu Europium 63		Gd Gadolinium 64	
Tb Terbium 65		Dy Dysprosium 66	
Ho Holmium 67		Er Erbium 68	
Tm Thulium 69		Yb Ytterbium 70	
Lu Lutetium 71			
Ac Actinium 89		Th Thorium 90	
Pa Protactinium 91		U Uranium 92	
Np Neptunium 93		Pu Plutonium 94	
Am Americium 95		Cm Curium 96	
Bk Berkelium 97		Cf Californium 98	
Es Einsteinium 99		Fm Fermium 100	
Md Mendelevium 101		No Nobelium 102	
Lr Lawrencium 103			

Key to Energy Values

K_{α}
Ag
47
 K_{β}

www.thermo.com/niton

Thermo
ELECTRON CORPORATION

NITON Analyzers NO
Model: Niton XLt™
Phone: +1 978 670-7460
Toll Free: 800-875-1578
Fax: +1 978 670-7430

NITON Analyzers Europe
Model: Niton XLt™
Phone: +49 39 3681 380
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Model: Niton XLt™
Phone: +852 2869 6669
Fax: +852 2869 6665

E-mail: niton.asia@thermo.com

X-Ray Energy Reference

89 - 103

57 - 71

NITON® XLt™ K shell range Al (13) to Ba (56)
L shell range Cs (55) to U (92)

NITON® XLt™ Light Matrix - Application-specific configuration only

NITON® Infiton™ Alloy and PMA modes only

He shell range Ti (22) to Dy (66)
L shell range Ho (67) to U (92)

He shell range: 432.2 years

APPENDIX C

Standard Operating Procedures for Field Equipment

i500, i1200, i2600 Owner's Manual

****TROUBLESHOOTING NOTE:** Some scale owners (especially with the i2600) have noted that their scale will give a MUCH more accurate calibration if calibration is performed as quickly as possible (not pausing between steps). This is especially true in the step after you have placed the calibration weight on the tray. If your scale is acting inaccurate after calibration, please try recalibrating 'as quickly as possible'.

Low Batteries, bad battery connections & Faulty AC Adaptors are the #1 cause of scale malfunction and inaccuracy! We test all of our scale returns from consumers. Fully 60% of consumer returns are battery related problems. This sounds silly but it's true! A scale will perform slowly, or read inaccurately when it has low batteries. Please replace the batteries often (and only use good quality batteries). We include good quality batteries with all of our scales but batteries can run low in storage. If your scale simply won't turn on while on Battery power, this is often caused by loose battery connections. Battery prongs (terminals) are made of metal. They must be making good contact with your batteries in order for the scale to power on. You can use a paperclip to slightly bend the battery prongs to make them have a better connection. Also some poorly designed batteries have recessed or partially obstructed battery terminals. This may cause your prongs to be touching the plastic housing of the battery instead of the metal battery terminal. A Faulty AC adaptor can cause your scale to act unstable with numbers "jumping" all around. Please test your scale with a good set of batteries (instead of the AC adaptor) to determine if perhaps the AC adaptor is faulty.

Due to the SS tray of the iBalance, this model is especially prone to being charged with Static Electricity. Please discharge any static electricity if you think your scale is acting unstable.

SAFETY PRECAUTIONS

All safety messages are identified by the words **warning** and **caution**. These words mean the following:

Warning Important information to alert you to a situation that might cause serious injury and damage to your property if instructions are not followed.

Caution

Important information that tells how to prevent damage to the equipment.

When using the i500/i1200, the following safety precautions should always be followed.

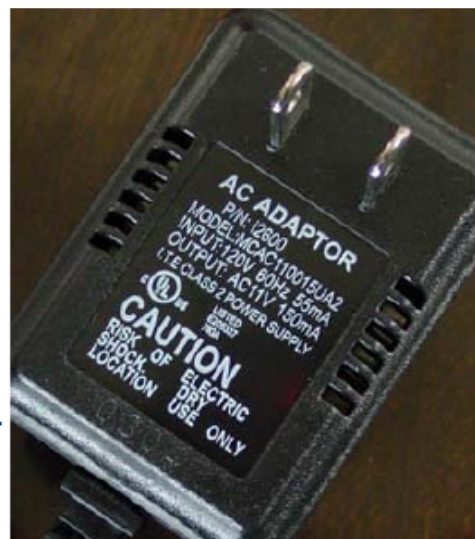
Warning: Use only the correct AC adaptor with the scale. Other adaptors may cause permanent electrical damage. The i2600 uses an adaptor that is different from the i500 and i1200. For reference, the i2600 adaptor is pictured here:

Caution: Avoid placing the scale in direct sunlight, this may cause discoloration or malfunction.

Replace all batteries at the same time. Do not replace only a portion of the 6 batteries as this may cause a malfunction.

If the scale is not to be used for a long period of time, remove all batteries from the battery compartment to avoid leakage which may cause damage to this scale.

Avoid overloading the scale, as this may cause permanent damage.



Keep the scale away from water. This scale is not water resistant. Shock, injury and electrical damage can occur if used in a wet location!

Matter charged with static electricity could affect accuracy. Discharge all static electricity. As example, one method is to use electrification prevention spray, and spray it on both side of weighing platform.

SPECIFICATIONS

Model number i500 Capacity 500g Division .1g
Model number i1200 Capacity 1200g Division .1g
Platter / Tray 145~145mm
Net/gross weight 460/650g
Package Standard carton: 22.5~15.5~4.8(cm3)
24 Units in one box: 48~48~22(cm3)
Operating Temperature 0-40c (32-104f)
Power source 6~AA Size Batteries or AC/DC
Adapter 9V/100mA (optional)

CALIBRATION

When to calibrate - calibration is RARELY required. Calibration may be required when the scale is first set up for use, or if the scale is moved to a different altitude or gravitation. This is necessary because the weight of a mass in one location is not necessarily the same in another location. Also, with time and use, mechanical deviations can occur.

For the i500 you must have an accurate 500 gram weight or a combination of weights that equals 500 grams in order to calibrate. **For the i1200 there are 2 models:** For the 2003 i1200 you must have an accurate 1200 gram weight or a combination of weights that equals 1200 grams in order to calibrate. For the 2004 i1200 you must have an accurate 1000 gram weight or a combination of weights that equals 1000 grams in order to calibrate. For the i2600 (2004-Current models) the correct calibration weight is 2000 grams. For i2600 (2002 & 2003 models) the correct calibration weight is 2600 grams

Calibration Procedure:

1. Before entering calibration mode, be sure the scale is powered OFF (must be OFF)
2. Enter calibration mode. Press [ON/OFF] to turn the power off. Press and hold [ZERO] first, then Press [ON/OFF] while keeping the [ZERO] button depressed, the display will show the A/D value (a series of random numbers).
3. Calibration by the weight. Wait for the stable indicator to be displayed, Press [SET] the display will show "00SAVE", after 2 seconds, the display will return to the A/D value.
4. Place the correct calibration weight on platform (see note above), then immediately press [SET], the display will show "00SAVE" and calibration is finished.

5. Press [ON/OFF], turn off the power, calibration is complete.

Counting procedures

1. Press [ON/OFF] to turn on the scale.

Wait for "0" to appear on the display.

2. Start the Count Procedure

If necessary, press [ZERO] key to set the display to "0".

3. Place a given number of samples of an item on the pan (the Sample Size should be either 10, 20, 50 or 100 pieces). The weight of these samples will show on the display.

4. Press the [SET] key several times to put the scale in PCS mode (the indicator should be on pcs).

5. Select the sample size (the same as you chose above) by pressing the [PCS] key (press it as many times as necessary to put it in the correct sample size (the sample size is the same as in step three =10, 20, 50 or 100),

6. Press the [SET] key, the display will show "pass", then after 2 seconds, the scale will remember the sample size you selected and show the starting sample size on the display (you can now remove the samples if you want to return the scale to 0)

7. Place the items that you want counted onto the tray and the total number of items will show on the display.

8. Press the "SET" key to exit the counting function and return to normal weighing or you can press ON/OFF to turn the scale off.

NOTE: the weight of unit sample > 10e.

FEATURES

Auto shut off. Auto calibration

Auto zero tracking and Auto backlight

Low battery indication and 8 mode conversion

Large LCD (6digits 15 mm high)

Large square stainless steel weighing tray

Net weight/stability indication

0.1 gram division with professional accuracy

PARTS DESCRIPTIONS

Side

AC adaptor

Socket

Top

Weighing platform: The arch face of platform is front, Correct the direction of the pan.

Protectors: Remove these before use

Display

ON/OFF key: Turns the scale Power on/off.

MODE key; Changes weighing units, g/oz/ozt/dwt/lb/gn/ct/n. ZERO key (for TARE): Sets display to zero or Subtracts weight of a container.

Bottom

Battery compartment, Battery compartment cover, Batteries: Use 6 AA batteries

Zero indicator: Indicates when the scale zero is correct. Weighing unit

Stable indicator: Indicates when the reading is stable.

Low battery indicator

PREPARATION

Installing batteries/Connecting the AC adaptor

Remove the battery compartment and insert six Dry batteries(R6P/LR6/AA size) into the battery compartment. Use extreme care that the polarities plus and minus are correct.

Plug the AC adapter to the AC adapter socket on the side. The AC input requirement could be 100,120,220,230 or 240Volts (50/60Hz) depending on the area where used, so please verify that the adaptor is correct.

Setting up the i500

Caution: Avoid placing the scale in direct sunlight, this may cause discoloration or malfunction. Place your i500/i1200 on a firm weighing table so that the scale is level. (The scale will not perform accurately when it is not level.) Make sure there are absolutely NO air currents or vibrations. They can cause inaccurate readings.

Place the scale on a firm surface that is flat and level for accurate weighing.

Weighing

Before weighing, a several second warm up time is required after turning the power on so that the scale will function properly and accurately. Calibration may be required before weighing. Calibration is rarely needed. Read "CALIBRATION" first and if necessary, calibrate your scale for accurate weighing.

Weighing Procedure

1. Press [ON/OFF] to turn on the scale. When the power is turned on, all display segments appear for a few seconds and "0" will appear on the display.
2. Select the weighing unit with [SET]. Press [SET] to select a weighing unit (g, oz, ozt, dwt, etc..). Once the unit has been selected, the selected unit will be displayed next to the weight value.
3. Start weighing. If you do not use a container for weighing, Verify the reading is "0". If not, press [ZERO] to display "0". Place objects on the weighing platform to weigh. When the reading becomes stable, the stable indicator is displayed. If you use a container for weighing, Place an empty container on the platform. Wait for the stability indicator to be displayed and press [ZERO]. Place the objects to be weighed in the container. When the reading becomes stable, the stable indicator is displayed.

FUNCTION SETTINGS (2003 - Current models only)

1. Enter function setting mode.

Press [ON/OFF] to turn the power off, Press [Mode] first, then press [ON/OFF], while keeping [Mode] pressed, the display will show **b_on** arrow direct to light, this means enter the selection of auto backlight mode. Press [Mode] key again, the display will show d-on arrow direct to A-OFF, this means enter the selection of auto shut off mode.

2. Selection of auto backlight mode.

The [ZERO] key use to select auto backlight function, when the scale enter function setting menu and the display will show **b_on** arrow, this means auto backlight function active, press [ZERO] again, the display will not show **b_off** arrow, this means auto backlight function inactive.

3. Selection of auto shut off mode.

The [Mode] key use to select auto shut off function, when the scale enter function setting menu and the display will show d_on arrow, this means auto shut off function active. Press [Mode] again, the display will not show d_off arrow, this means auto shut off function inactive.

4. Return to weighing mode.

Instruction Manual

HI 98331 Direct Soil Conductivity & Temperature Meter



HANNA
instruments
www.hannainst.com

WARRANTY

HI 98331 is warranted for one year against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. The probe is warranted for a period of six months. This warranty is limited to repair or replacement free of charge.
Damage due to accidents, misuse, tampering or lack of described maintenance is not covered.

SPECIFICATIONS

Range	Conductivity: 0.00 to 4.00 mS/cm ($\mu\text{S}/\text{m}$) Temperature: 0.0 to 50.0 °C
Resolution	Conductivity: 0.01 mS/cm Temperature: 0.1 °C
Accuracy (@ 20 °C)	Conductivity: $\pm 0.05 \text{ mS}/\text{cm}$ (0.00 to 2.00 mS/cm) $\pm 0.30 \text{ mS}/\text{cm}$ (2.00 to 4.00 mS/cm) Temperature: $\pm 1 \text{ °C}$
Temperature Compensation	Automatic, temperature coefficient (B) fixed @ 2%/°C
Calibration	1 point manual
Battery Type	4 x 1.5V button type
Probe (included)	HI 73331 122 mm (4.8") penetration
Environment	0.0 to 50.0 °C
Dimensions	163 x 40 x 26 mm (6.4 x 1.6 x 1.0") 150 mm for probe
Weight	100 g (3.5 oz.)

* The meter gives indicative readings with lower accuracy between 4mS/cm and 10 mS/cm.

OPERATIONAL GUIDE

Taking measurements

Connect the HI 73331 probe. The meter requires the probe in order to do any measurement. Press the ON/OFF button to turn the meter ON. Place the probe to the desired depth and saturate the soil if needed. The conductivity value, automatically compensated for temperature, will be shown on the LCD. The meter displays conductivity in mS/cm, which is equivalent to dS/m.

Pressing the TEMP button, the temperature measured by the probe will be shown while the button is held.

Note: Before taking any measurement make sure the meter has been calibrated.

PROBE MAINTENANCE

Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for a correct operation. Please read it carefully before using the meter.
If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com.

This instrument is in compliance with CE directives.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully. If any damage has occurred during shipment, immediately notify your Dealer or the nearest Hanna Customer Service Center.

Each meter is supplied with:

- HI 73331 Penetration conductivity probe
- 4 x 1.5V batteries
- Calibration screwdriver

Note: Conserve all packing material until the instrument has been observed to function correctly. Any defective item must be returned in its original packing.

US DESIGN PATENT
D462,024

GENERAL DESCRIPTION

HI 98331 is a special pocket meter expressly designed to directly measure soil conductivity. The meter also measures temperature, and the conductivity readings are compensated for temperature with a sensor incorporated in the HI 73331 penetration probe.

The probe is interchangeable, and it can be easily realized by the user.

CALIBRATION

For better accuracy, frequent calibration of the instrument is recommended. In addition, the instrument must be recalibrated whenever:

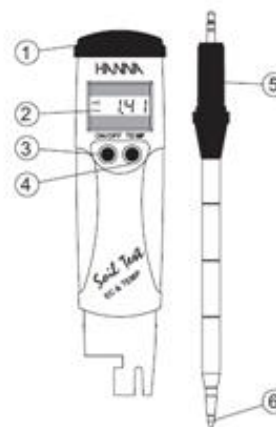
- The conductivity probe is replaced.
- When high accuracy is required.
- At least once a month.

Calibration procedure

Immerse the tip of the probe in a beaker with HI 70031P 1413 $\mu\text{S}/\text{cm}$ solution. The tip of the probe should be about 2" deep in the liquid. The probe should be kept at least 1" from the walls and the bottom of the beaker. Adjust the trimmer to read 1.41 on the LCD.



FUNCTIONAL DESCRIPTION



1. Battery compartment
2. Liquid Crystal Display (LCD)
3. ON/OFF button
4. TEMP button
5. HI 73331 Direct soil conductivity penetration probe
6. Incorporated temperature sensor in tip of probe

BATTERY REPLACEMENT

To change the batteries, remove the 4 screws located on the top of the meter.



Once the top has been removed, carefully replace the 4 batteries located in the compartment while paying attention to their polarity.



Replace the top, making sure that the gasket is properly seated in place, and tighten the screws to ensure a watertight seal.

ACCESSORIES

- HI 73331 Direct soil penetration conductivity probe
- HI 7031M 1413 $\mu\text{S}/\text{cm}$ (1.4 mS/cm) @25°C calibration solution, 230 mL bottle
- HI 7031L 1413 $\mu\text{S}/\text{cm}$ (1.4 mS/cm) @25°C calibration solution, 460 mL bottle
- HI 731326 Calibration screwdriver, 20 pieces

TROUBLESHOOTING

Recommendations for Users

Instruction Manual

HI 99121
Soil pH Test Kit

SOIL pH

pH is the measure of the hydrogen ion concentration $[H^+]$. Soil can be acid, neutral or alkaline, according to its pH value. Fig. 1 shows the relationship between the scale of pH and types of soil. Most plants prefer a pH range from 5.5 to 7.5; but some species prefer more acid or alkaline soils. Nevertheless, every plant requires a particular range of pH, for optimum growth.

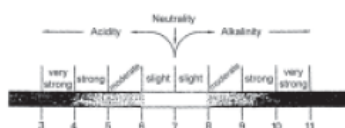


Fig. 1. Types of soil according to the pH value

pH strongly influences the availability of nutrients and the presence of microorganisms and plants in the soil. For example, fungi prefer acidic conditions whereas most bacteria, especially those supplying nutrients to the plants, have a preference for moderately acidic or slightly alkaline soils. In fact, in strongly acidic conditions, nitrogen fixing and the mineralization of vegetable residual is reduced. Plants absorb the nutrients dissolved in the soil water and the nutrient solubility depends largely on the pH value. Hence, the availability of elements is different at different pH levels (Fig.2).

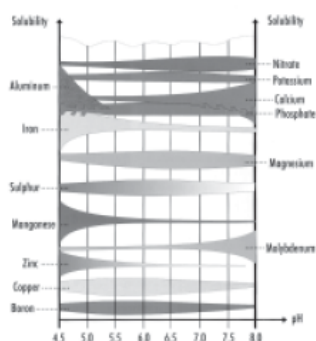


Fig. 2. Solubility of the elements according to varying pH

Each plant needs elements in different quantities and this is the reason why each plant requires a particular range of pH to optimize its growth.

For example, iron, copper and manganese are not soluble in an alkaline environment. This means that plants needing these elements should theoretically be in an acidic type of soil. Nitrogen, phosphorus, potassium and sulfur, on the other hand, are readily available in a pH range close to neutrality. Furthermore, abnormal pH values, increase the concentration of toxic elements for plants. For example, in acid conditions, there can be an excess of aluminum ions in such quantities that the plant can not tolerate.

Negative effects on chemical and physical structure are also present when pH values are too far from neutral conditions (break up of aggregates, a less permeable and more compact soil).

Management of the soil in relation to the pH value

Once the pH value is known, it is advisable to choose crops that are suitable for this range (e.g. in an acid soil, cultivate rice, potato, strawberry).

Add fertilizers that do not increase acidity (for example urea, calcium nitrate, ammonium nitrate and superphosphate) or lower alkalinity (e.g. ammonium sulfate).

It is recommended that a cost evaluation is made prior to commencement of the soil pH modification. Corrective substances can be added to modify the soil pH, however, the effects are generally slow and not persistent. For example, by adding lime, the effects in clay soil can last for as long as 10 years, but only 2-3 years in a sandy soil.

For an acid soil, we can use substances such as lime, dolomitic, limestone and marl, according to the nature of the soil (Tab.1).

Soil Ameliorants	Clay soil	Silty soil	Sandy soil
CaO	30-50	20-30	10-20
Ca(OH) ₂	39-66	26-39	13-26
CaMg(CO ₃) ₂	49-82	33-49	16-33
Ca CO ₃	54-90	36-54	18-36

Tab.1. Quantity (q/ha) of pure compound necessary to increase 1 unit of pH

High pH levels can depend on different elements, hence, there are different methods for its correction.

- Soils rich with limestone:

Add organic matter (this is due to the fact that non-organic ameliorants such as sulfur and sulfuric acid might not make economic sense due to the large quantities needed).

- Alkaline-saline soils:

Alkalinity is due to the presence of salts (in particular a high concentration of sodium can be harmful).

Irrigation washes away salts, hence, an appropriate use of irrigation can provide positive results (drop-irrigation being the most recommended).

If alkalinity is caused by sodium, it is recommended to add substances such as gypsum (calcium sulfate), sulfur or other sulfuric compounds (Tab.2). Also in this case, a cost evaluation is necessary.

Soil ameliorants (pure compounds)	Quantity (kg)
Calcium chloride: $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	85
Sulfuric acid: H_2SO_4	57
Sulfur: S	19
Iron sulfate: $\text{Fe}_2(\text{SO}_4)_3 \cdot 7\text{H}_2\text{O}$	162
Aluminum sulfate: $\text{Al}_2(\text{SO}_4)_3$	129

Tab.2. Quantities provide the same result as 100 kg of gypsum

Procedure for direct ground measurement

- 1) Dig, discarding 5 cm of topsoil
- 2) Perforate the soil (with **HI 721319** soil drill) to a depth of about 20 cm or more
- 3) If the soil is dry, moisten it with a small amount of distilled water
- 4) Wash the electrode with tap water (not distilled)
- 5) Insert the electrode pushing it slightly into the soil to ensure proper contact
- 6) Observe the measurement
- 7) Wash the electrode with tap water (not distilled) and (using a finger) gently remove any soil remaining on the electrode (avoid using a rag or cloth)
- 8) Repeat the procedure in different locations in the field
- 9) Consider the average of the measured data

For best result, it is advisable to measure the pH of a soil solution, using a sample of soil and soil preparation solution **HI 7051**; it is better to use this procedure if you have to test a stony field in which you risk damaging the electrode.

Procedure for the measurement of soil solution (1:2,5)

A) Sampling

1) Extracting Soil Sample.

Take 1 sample per 1000 m² (0.25 acre) of homogeneous area.

Even for small areas, 2 samples are recommended (the more the samples, the better the end-results, because the result is more representative).

2) Avoid extracting samples from soil presenting obvious anomalies and consider them separately.

3) Sample quantity:

Take the same quantity of soil for each sample. For example, use bags with similar dimensions (1 bag per sample).

4) Depth of extraction:

General: dig and discard 5 cm (2") of topsoil.

Herbaceous crops: from 20 to 40 cm of depth (8" to 16").

Orchards: from 20 to 60 cm of depth (8" to 24").

5) Spread the soil samples on the pages of a newspaper and let the soil dry in a shady place or put it in an oven at 40°C.

6) Crumble the dried soil and mix all the samples together to obtain a homogeneous mixture, discarding stones and vegetable residues.

7) From this mixture, take the soil sample for analysis.

B) Soil solution preparation and measurement

1) Sift the soil at 2 mm.

2) Weigh 10 g of soil and put it in 25 ml of soil preparation solution **HI 7051** (use the apposite beaker) or 20 g of soil per 50 ml of soil preparation solution **HI 7051**.

3) Mix for 30 seconds.

4) Wait for about 5 minutes.

5) Mix again and measure the pH of the solution.

ORGANIC SUBSTRATE

pH measurements of organic substrates is important in greenhouses and nursery growing pots. pH should be checked at the outset to make sure that the pH of the substrate bought is that desired (pH can change if too much time elapses from the date of packaging to the moment of utilization).

A) Direct measurement in pot

If the substrate is dry, add a little distilled water. Insert the electrode into the soil and take measurement.

B) Measurement of the organic substrate solution (1:2)

Let the substrate dry and discard the coarse vegetable residues and pebbles.

Prepare a solution composed of 1 part of mould and 2 parts of **HI 7051** solution (for example: fill the beaker with the substrate up to 50 ml, press it gently, empty the content in another container and add 100 ml of **HI 7051** solution).

Mix for 30 seconds and then wait for 5 minutes. Mix again and measure the pH of the solution.

IRRIGATION WATER

The quality of irrigation water is a very important factor. If the pH value is very far from pH 7, it is possible that other anomalies are present.

Ranges for evaluation of water quality:

- 6 to 8.5 pH: good, it can be utilized without problems.
- 5 to 6 pH or 8.5 to 9 pH: sufficient, sensible crops could have problems.
- 4 to 5 pH or 9 to 10 pH: scarce, use it carefully, avoid wetting the vegetation.
- pH<4 or pH>10: very scarce, there are other anomalies that have to be identified via chemical analysis.

NUTRIENT SOLUTION

A rational fertilization is needed for optimum plants growth in greenhouses. The pH value of the nutrient solution (water + fertilizer) has to meet the plants need.

If a fertirrigation system with automatic pH control is used, ensure that it is functioning properly.

Check the pH of the irrigation solution as well as any recycled solution.

ORCHARD PLANTS

Preferred pH Range		Preferred pH Range	
Apple	5-6.5	Orange	5-7
Apricot	6-7	Peach	6-7.5
Cherry	6-7.5	Pear	6-7.5
Grapefruit	6-7.5	Plum	6-7.5
Grapevine	6-7	Pomegranate	5.5-6.5
Lemon	6-7	Walnut	6-8
Nectarine	6-7.5		

VEGETABLES AND HERBACEOUS CULTIVATIONS

Preferred pH Range		Preferred pH Range	
Artichoke	6.5-7.5	Pepper	6-7
Asparagus	6-8	Early Potato	4.5-6
Barley	6-7	Late Potato	4.5-6
Bean	6-7.5	Sweet Potato	5.5-6
Brussels Sprout	6-7.5	Pumpkin	5.5-7.5
Early carrot	5.5-7	Rice	5-6.5
Late carrot	5.5-7	Soybean	5.5-6.5
Cucumber	5.5-7.5	Spinach	6-7.5
Egg Plant	5.5-7	Strawberry	5-7.5
Lettuce	6-7	String	6-7.5
Maize	6-7.5	Sugar beet	6-7
Melon	5.5-6.5	Sunflower	6-7.5
Oat	6-7	Tomato	5.5-6.5
Onion	6-7	Watermelon	5.5-6.5
Pea	6-7.5	Wheat	6-7

LAWN

Preferred pH Range
Lawn 6-7.5

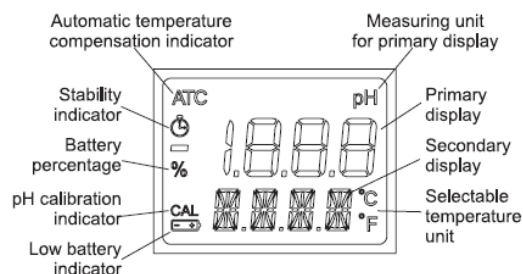
GARDEN PLANTS AND FLOWERS

Preferred pH Range		Preferred pH Range	
Acacia	6-8	Ligustrum	5-7.5
Acanthus	6-7	Magnolia	5-6
Amaranth	6-6.5	Narcissus	6-8.5
Bougainvillea	5.5-7.5	Oleander	6-7.5
Dahlia	6-7.5	Paulownia	6-8
Erica	4.5-6	Portulaca	5.5-7.5
Euphorbia	6-7	Primula	6-7.5
Fuchsia	5.5-7.5	Rhododendron	4.5-6
Gentian	5-7.5	Roses	5.5-7
Gladiolus	6-7	Sedum	6-7.5
Hellebore	6-7.5	Sunflower	5-7
Hyacinth	6.5-7.5	Tulip	6-7
Iris	5-6.5	Viola	5.5-6.5
Juniper	5-6.5		

HOUSE PLANTS

	Preferred pH Range		Preferred pH Range
Abutilon	5.5-6.5	Gardenia	5-6
African violet	6-7	Geranium	6-8
Anthurium	5-6	Hibiscus	6-8
Araucaria	5-6	Jasmine	5.5-7
Azalea	4.5-6	Kalanchoe	6-7.5
Begonia	5.5-7.5	Mimosa	5-7
Camellia	4.5-5.5	Orchid	4.5-5.5
Croton	5-6	Palms	6-7.5
Cyclamen	6-7	Peperomia	5-6
Dieffenbachia	5-6	Philodendron	5-6
Dracaena	5-6	Yucca	6-7.5
Freesia	6-7.5		

pH METER SPECIFICATIONS



Range (*)	-2.00 to 16.00 pH -5.0 to 105.0°C / 23.0 to 221.0°F
Resolution	0.01 pH / 0.1°C / 0.1°F
Accuracy (@20°C/68°F)	±0.02 pH ±0.5°C up to 60°C; ±1°C outside ±1°F up to 140°F; ±2°F outside
Temperature Compensation	Automatic
pH Calibration	Automatic, 1 or 2 point with 2 sets of memorized buffers
Probe (included)	HI 1292D pH/temperature probe
Battery Type / Life	3 x 1.5V AA (IEC LR6) / approx. 1500 hours
Auto-off	After 8 minutes of non-use
Environment	0 to 50°C (32 to 122°F); RH 100%
Dimensions	150 x 80 x 36 mm (5.9 x 3.2 x 1.4")
Weight	210 g (7.4 oz.)

(*) The temperature range is limited to 80°C (176°F) if using the HI1292D probe.

To clean the meter, use water only.

OPERATING THE pH METER

To connect the probe

With the meter turned off, connect the **HI 1292D** probe to the DIN socket on the top of the meter by aligning the pins and pushing in the plug. Tighten the nut to ensure a good connection. Remove the protective cap from the probe before taking any measurements.

To turn the meter ON and check the battery status

Press the ON/OFF/MODE button until the display lights up. At start-up, all the LCD segments are displayed for 1 second, then the percent indication of the remaining battery life is shown for another second (E.g. % 100 BATT). The meter then enters the normal measuring mode.

Note: If the display needs to be checked, keep the ON button pressed while turning the meter on. The meter will display all segments as long as the button is pressed.

To freeze the display

While in measurement mode, press the SET/HOLD button, HOLD appears on the secondary display and the reading will be frozen on the LCD (E.g. pH 5.73 HOLD). Press any button to return to normal mode.

To turn the meter OFF

While in normal measurement mode, press the ON/OFF/MODE button. OFF will appear on the secondary display. Release the button.

Note: The meter is provided with an acoustic signal feature, which can be disabled using the switch located in the battery compartment.

Note: When the meter detects the absence of a temperature probe at its input, the Automatic Temperature Compensation is turned off, and the meter uses a default value of 25°C (77°F) for the temperature measurement and compensation. In this condition, the secondary LCD shows 25.0°C (77.0°F) blinking. When a probe is connected, the meter automatically returns to the ATC mode, the ATC tag is turned on, and the temperature is shown on the secondary display.

pH MEASUREMENT & CALIBRATION

- Make sure the meter has been calibrated before use.
- If the probe is dry, soak it in **HI 70300** storage solution for one hour to reactivate it.
- Place the tip of the probe into the sample to be tested, stir briefly and wait until the stability symbol on the LCD is turned off.
- The LCD shows the pH value (automatically compensated for temperature) on the primary LCD, while the secondary LCD shows the temperature of the solution.
- If measurements are taken in different samples successively, rinse the probe tip thoroughly to avoid contaminations. After cleaning, rinse the probe tip with some of the sample to be measured.

pH calibration

For better accuracy, a **frequent electrode cleaning** (see also pag. 15) and **meter calibration** is recommended.

In addition, the instrument must be recalibrated whenever:

- a) The pH electrode is replaced.
 - b) After testing aggressive chemicals.
 - c) Where high accuracy is required.
 - d) At least once a month.
- From normal mode, press & hold ON/OFF/MODE until OFF on the secondary display is replaced by CAL. Release the button.
 - The LCD enters the calibration mode, displaying "pH 7.01 USE" (or "pH 6.86 USE" if the NIST buffer set was selected). After 1 second the meter activates the automatic buffer recognition feature. If a valid buffer is detected, then its value is shown on the primary display, and REC appears on the secondary LCD. If no valid buffer is detected, the meter keeps the USE indication active for 12 seconds, and then replaces it with WRNG, indicating that the sample being measured is not a valid buffer.
 - For a single-point calibration with buffers pH 4.01, 9.18 or 10.01, the meter automatically accepts the calibration when the reading is stable; the meter will show on the primary display the accepted buffer, with the message "OK 1" on the secondary display, and an audible signal is produced. After 1 second the meter automatically returns to the normal measuring mode. If a single-point calibration with buffers pH 7.01 or 6.86 is desired, then after the calibration point has been accepted press the ON/OFF/MODE button in order to return to the normal measuring mode. After the button is pressed, the meter shows

"7.01" (or "6.86") - "OK 1", and an audible signal is produced. After 1 second, the meter automatically returns to the normal measuring mode.

Note: It is always recommended to carry out a two-point calibration for better accuracy.

- For a two-point calibration, place the probe in pH 7.01 (or pH 6.86) buffer. After the calibration point has been accepted, the "pH 4.01 USE" message appears. The message is held for 12 seconds, unless a valid buffer is recognized. If no valid buffer is recognized, then the WRNG message is shown. If a valid buffer (pH 4.01, pH 10.01 or pH 9.18) is detected, then the meter completes the calibration procedure. When the buffer is accepted, the LCD shows the accepted value with the "OK 2" message on the secondary display. The meter then returns to the normal measuring mode.

Note: When the calibration is completed, the CAL tag is turned on.

To quit calibration and to reset to the default values

- After entering the calibration mode and before the first point is accepted, it is possible to quit the procedure and return to the last calibration data by pressing ON/OFF/MODE. The secondary LCD displays ESC for 1 sec. and the meter returns to normal mode.
- To reset to the default values and clear a previous calibration, press the SET/HOLD button after entering the calibration mode and before the first point is accepted. The secondary LCD displays CLR for 1 sec, the meter resets to the default calibration and the "CAL" tag on the LCD disappears.

METER SETUP

Setup mode allows to select the temperature unit and the pH buffer set. To enter the Setup mode, press & hold ON/OFF/MODE until CAL on the secondary display is replaced by TEMP and the current temperature unit (E.g. TEMP °C). Then:

- for °C/°F selection, use the SET/HOLD button. After the temperature unit has been selected, press ON/OFF/MODE to enter the buffer set selection mode; press ON/OFF/MODE twice to return to the normal measuring mode.
- to change the calibration buffer set, after setting the temperature unit, the meter will show the current buffer set: "pH 7.01 BUFF" (for 4.01/7.01/10.01) or "pH 6.86 BUFF" (for 4.01/6.86/9.18). Change the set with the SET/HOLD button, then press ON/OFF/MODE to return to normal mode.

ELECTRODE CLEANING

A frequent cleaning of the pH electrode is strongly recommended to ensure correct calibration and reliable readings.

Hanna Instruments has developed a complete series of cleaning solutions dedicated to specific applications and kind of dirty that has to be removed from the electrode.

In soil measurements you can choose between two different solutions accordingly to the type of tested soil:


- **HI 700663** is indicated for inorganic soil deposits (as minerals, limestone, adsorbed clays)
- **HI 700664** is specific for organic soil deposits (humus)

If cleaning is performed frequently, soak the electrode in the specific solution for a few minutes.

If the electrode has not been cleaned for a while, for a complete removal of soil deposits, proceed as follows:

- wipe the electrode body (not bulb) with paper or soft tissue
- rub the reference with abrasive paper
- immerse into cleaning solution for at least 15 minutes.

BATTERY REPLACEMENT

The meter displays the remaining battery percentage when turned on. When the level is below 5%, the  symbol on the bottom left of the LCD blinks to indicate a low battery condition. If the battery level is low enough to cause erroneous readings, the Battery Error Prevention System (BEPS) turns the meter off. Unscrew the 4 screws located on the back of the meter and carefully replace the 3 AA batteries located in the battery compartment, while paying attention to their polarity. Reattach the back making sure that the gasket is in place and tighten the 4 screws to ensure a watertight seal.